

VOCATIONALISATION AT THE HIGHER SECONDARY STAGE
OF THE 10+2+3 PATTERN OF EDUCATION

DR. (Mrs). J.K.PILLAI

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Madurai Kamaraj University.
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Dr. (Mrs) J.K.PILLAI

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1.00 RATIONALE OF THE PROJECT.

1.10. INTRODUCTION

The new pattern of 10+2+3 is an educational reform of great significance and its universal adoption in all parts of the country, it is expected, would bring in several advantages, some of which are:-

1. A uniform educational system in all parts of the country would facilitate the adoption of the concept of national system of education.

2. The ten years of integrated broadbased general education containing some elements of vocational and technical education would strengthen the quality of general education.

3. The two year block of higher secondary stage providing a wide range of vocational courses would be able to divert a fair proportion of students to prepare for different walks of life.

4. Raising the total duration of academic preparatory programme to 12 years would enable able, mature and better prepared students to enter universities.

5. Three years of undergraduate course will meet the demands of specialization, interdisciplinary approach and project oriented studies.

The three main objectives of this reform visualized by the planners are:-

1. to provide good quality general education for all students.
2. to provide varied programmes for those who wish to develop and use their occupational skills immediately after finishing school.
3. to provide adequate programmes for those who wish to pursue general or professional education in a college or university.

1.20. BACKGROUND

This reform has been overdue for more than half a century. It was first recommended by Calcutta universities Commission(1917-1918) which was convened under the chairmanship of Sir Michael Sadler. To quote from the report," we regard the proposal to institute intermediate colleges as the very point of our whole scheme or reform------. The intermediate college must be regarded as fulfilling a double purpose. In the first place, it must provide a training such as will qualify the students for admission to universities or other institution for higher or technological training. In the second place, it must provide a training suitable for students who after completing

this course will proceed direct into various practical occupations. As the system develops we should expect to find an increasing number of students entering upon the intermediate course solely with a view to preparing themselves for various practical careers". This commission also recommended that the undergraduate course must be increased to three years after intermediate so that the standards could be improved and thus be comparable to the first degree in advanced countries.

No university was prepared to increase the duration of the first degree course to three years and nor ready to hand over to intermediate courses to schools.

The University Education Commission under the Chairmanship of Sir Radhakrishnan (1948-49) reiterated the same that the pressure on university admission should be reduced, students should be prepared for employment in different walks of life, at the end of the secondary school and the undergraduate course should be lengthened to three years.

The Secondary Education Commission under A.L. Mudaliar in 1952 re-affirmed the same suggestion but accepted a compromise pattern of 11+3 during

the transition period. The existing intermediate stage was to be abolished, the period of secondary education increased by one year and the three year degree course at the university stage was planned. This commission also advocated the ~~university~~ conversion of the existing unilateral schools to some kind of multipurpose school by introducing diversified streams of study.

The pattern suggested by the Secondary Education Commission was accepted and implemented in a number of states. Quite a few schools diversified their curriculum and offered technical, commercial, agriculture, fine arts and Homescience branches besides the humanities and science streams. A few senior technical schools were established as separate units. But unfortunately, due to lack of faith in the whole idea of diversification of education, the multipurpose schools proved to be a failure. The debate on the 10+2 idea continued and the Education Commission of 1964-1966 has given a new fillip to this. While reviewing school structure, the commission points out some of the deficiencies such as low standard of undergraduate courses, undue expansion of secondary education and the resultant pressure on university admission, and the

unpppularity of vocational technical streams of study which if we peep back some fifty years--soon to be the same.

1.30 VOCATIONALIZATION

' Diverting pupils to non-literary pursuits' is not an entirely new idea either. The Indian Education Commission of 1882 under Hunter, almost a century back, records that the most important defect of secondary education is that "it is too exclusively directed to university studies" and recommended "bifurcation of the course of study at the highschool stage, one branch leading to the entrance examination of the universities and the other intended for youths of commercial or other non literary pursuits".

No institution, Government or private was prepared to meet the expenditure involved in provision of modern equipment or expert teachers necessary for vocational studies and as popular opinion was in favour of literary studies, things were just allowed to drift and Curzon in 1902 remarked that 95% of the boys who passed the secondary schools prepared for the college entrance examinations. The then of the various commissions and committees^e

of the country--Hartog Committee of 1927, Wood and Abbot report of 1935, Sargent report of 1944, Radhakrishnan Commission of 1948, Mudaliar Commission of 1952--has essentially been 'diverting pupils into non-literary pursuit', but due to various reasons, mainly due to lack of finance, opportunities for training in non-literary pursuits have been very few and inadequate to the needs of the population.

Ganhihi in his masterly analysis of the defects of the then existing system of education in the thirties, pointed out that the school curriculum was too literary and too bookish and gave a concret solution in the form of craft centred and work oriented basic education.

Basic education, after having been tried in a half- hearted manner has disappeared from the scene.

1.40 A CENTURY OF FAILURE

All attempts to divert pupils into non-literary pursuits, in other words, all programmes for vocationlizing education have met with failure, There is no denying the fact that some sporadic attempts have been successful, and there do exist

quite a few industrial training institutes, Polytechnics, junior technical schools, junior trade schools, senior technical schools and senior trade schools, in all the states. But it is found that only about 12% of the students population who go to secondary schools take to vocational courses.

In other advanced countries, 60% to 70% go for the so called 'polytechnical education'.

Why does India lag behind?

What are the causes of the failure of —
—the various schemes of vocationalization?

Is it due to conceptual reasons or is it at the operational level?

Is it due to a general lack of faith in the idea of vocationalization?

Is an inferior status still associated with non literary jobs in the public mind?

Is it due to lack of vocational consciousness?

Is there a lack of priority of esteem of the vocational stream with academic stream?

Is it due to lack of economic development?

Is it due to lack of industrialization of the country?

Is it due to poor implementation of the scheme?

Or, is it due to lack of financial assistance to the schemes?

1.50 PLANNING FOR VOCATIONALIZATION,

Vocationalization of education means making education more responsive to the needs of vocational

preparation to prepare the individual to play his occupational role in the economic life of the community more effectively.

The Indian Education Commission(1964-66) concretising the concept of vocationalization has spelt out three broad programmes:-

1. work experience programme to be an integral part of general education in primary and lower secondary stages.

2. vocational education and training programme for those who dropped out of school after class VIII and

3. vocational training programme for youth who have completed ten years of general education.

1. Work experience, it is hoped, would provide a correction to the overacademic nature of formal education; encourage the the formulation of desirable attitudes as experimentation, inventiveness, methodical work, dignity of manual work, self-reliance, discipline etc.

2. Training programmes for imparting and upgrading of skills in demand in the locality for those dropouts without jobs, it is hoped, would lead to definite employment or self-employment.

3. Phenomenal expansion of enrolment in school education in the last two decades has given impetus for higher education. 50% of the school leavers seek admission to university courses but as most of college education has been largely unrelated to man power needs and development requirements of the community and the country, unemployments among the educated has risen phenomenally.

On the other hand, a number of vacancies in the industries have remained unfilled due to non availability of suitable personnel. This gap between demand and supply has to be bridged by diversion of students from university education courses to vocational training courses which would lead them to suitable employment.

The Education Commission has recommended that 50% of the total enrolment at the higher secondary stage i.e. after the ten years of study should be diverted to vocational courses. This means organisation of meaningful vocational education programmes for millions of student population in the country. A variety of facilities for vocational education should be made available to meet the needs of boys and girls in urban and rural areas.

In this ongoing process of educational revolution, the questions that can be raised are:-

1. What kind of vocational courses in suitable for Indian youth in the next decade?
2. How should we go about concretizing this scheme with reference to present Indian economy?

An extensive study of the situation, involving educational institutions, industrial organizations, economic commitment and social directions can alone offer plausible solutions.

Planning for vocational courses should include the following guidelines:-

1. Identification of the areas in which vocational education programmes need to be initiated, considering the manpower shortages and training gaps as revealed by the employment exchange records.
2. Task analysis in terms of industry's needs, manpower forecasting, occupational studies and areas of self-employment.
3. Development of curriculum, identification of training methods, teaching aids, and evaluation techniques.

4. Identification of essential institutional structures considering what is already existing and available.

1.60. NEED FOR PILOT STUDIES.

A century of failure of vocationalization has been mainly due to poor conceptualization and implementation of the schemes. If the present attempt is to be a success, a good deal of careful preparation is needed and a few pilot studies in the different areas of the country on the following aspects would indicate the pattern of vocationalization to be implemented in the locality.

1. employment potential in the area.
2. industrial needs of trained man power.
3. proposed industrial expansion and establishments.
4. employment pattern in the area.
5. education^{al} institutions in the area.
6. liaison activities between the institutions and the industries.
7. population pattern in the area.
8. public schemes, plans and proposals.

Adequate planning in terms of curriculum development and teacher preparation is necessary before launching the programme. Mobilizing public opinion-the parents, students, teachers and the members of the community is another important step necessary for and towards the success of the programme.

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2.00 THE PROJECT.

2.10 TITLE.

VOCATIONALIZATION AT THE HIGHER SECONDARY
STAGE OF THE 10+2+3 PATTERN OF EDUCATION.

2.20 NATIONAL POLICY.

The National Policy of Educational Resolution
(1968) states:

"There is need to increase facilities for technical and vocational education at the secondary stage. Provisions of facilities for secondary and vocational education should conform particularly to requirements of the developing economy and real employment opportunities. Such linkage is necessary to make technical and vocational education at the secondary stage effectively terminal. The facilities for technical and vocational education should be suitably diversified, to cover a large number of fields such as agriculture, industry, trade and commerce, medicine and public health, home management, arts, and crafts and secretarial training."

2.21. The Central Advisory Board of Education (CABE) in its meeting held during 1975 recommended that the 10+2+3 pattern of education be adopted by the Government of India and the states of the country.

The Board, while noting with satisfaction the adoption of the educational pattern of 10+2+3 by most of the state Governments, deemed it necessary to stress the crucial importance of the 2 year stage between the school and university stages of education. It reiterated that this stage should be regarded not merely as a period for preparing an increasingly larger number of school leavers for different vocations in life.

2.22 The Government of India accepted the recommendations of the Central Advisory Board of Education (CABE) and asked the National Council of Educational Research and Training (NCERT) to prepare a document on the +2 stage of education. The NCERT in its paper entitled 'Higher Secondary Education and its Vocationalisation' proposed that vocationalisation should be introduced in the XI and XII standards and about 50 percent of the students should be siphoned off into vocational streams which have promising employment potentialities in the immediate future. The paper recommended two distinct streams namely the academic stream to prepare students for advanced education in science, social science, commerce and humanities and

the other vocational stream to prepare students for immediate occupations judiciously combining academic education with training in appropriate vocations.

The conference of Ministers of Education of the states and Union Territories held at New Delhi in August, 1977 recommended that the new pattern (10+2) be implemented all over the country before the end of the sixth plan.

To ensure countrywide acceptance of the concept of vocationalisation and to assist the state Governments in establishing the relevance and importance of this concept to our socio-economic needs, the Government of India launched during 1977, a centrally sponsored scheme of vocationalisation of higher secondary education. The main objective of the scheme is to encourage the state Governments to initiate the vocationalization of education at the plus two stage and to expand and consolidate it on a regular basis as a state scheme in the sixth Plan. The scheme had the following main components:

1. conduct of District vocational surveys in 150 districts.
2. introduction of vocational courses in 40 selected districts.

2.23. The major objectives of vocationalisation of school education at the higher secondary stage, as outlined by K. Gopalan(1980) in the Bulletin of the Unesco Regional Office for Education in Asia and Oceania were:-

1. To divert a sizeable section of school students to useful occupational programmes without sacrificing the educational content
2. To prepare the students for entrepreneurial vocation, with a sufficient amount of skills required for a particular occupational area, and
3. To prepare vocationally qualified manpower for a variety of occupations for which training facilities are seldom available in other systems of training, and
4. To prevent purposeless crowding in the universities.

2.30 In Tamilnadu, vocationalisation at the +2 stage was introduced at the higher secondary schools during 1977-78. Dr. K. Venkatasubramanian(1976), Director of School education of Tamilnadu, in his article on 'Better Utilization of vocationalization' pointed out that the importance aims of vocationalization were:-

1. to wipe out the evil of preparing students for white collar jobs. In a democratic developing nation, there is need for productivity-oriented education.

2. to reduce the pressure on higher education by diverting 50 percent of the students to the channels of vocationalization in higher secondary education by making them terminal for most of them.

3. to arrest the mounting educated unemployment problem and to match the supply of products of educational system with the manpower demands of the economic system.

Mr. C. Aranganayagam (1978), Minister of Education, Tamilnadu, ⁱⁿ his foreword to the pamphlet on 'Vocational programmes in Higher Secondary schools in Tamilnadu', pointed out that the new system of education should be programmed with a view to train not only those who would seek employment but also those who would create employment.

At present in Tamilnadu, at the +2 stage of higher secondary school education, two distinct streams of courses are offered; one is the academic stream to prepare students for higher education in universities, and the other is the vocational stream to prepare them for a variety of occupations through vocational studies and training.

2.40 NEED FOR THE PROJECT.

During the initial period of the implementation of the vocationalisation in different states, several problems cropped up. The study conducted by the NCERT (1979) on the implementation of vocationalization in the states highlighted 'unsatisfactory pre-implementation preparation' as one of the major problems which needed urgent attention. In this regard, 'the National Document on vocationalization of Education' recommended that for the vocational courses to be successful a closer linkage should be established between the economic activities and the educational programmes. It further recommended that in order to ascertain the employment potential and occupational patterns suitable

for aspirants of middle level jobs, a quick, but meaningful, occupational survey should be conducted in each district and the survey should identify suitable vocations relevant to the district in particular and useful to the country in general.

This was the context in which the project was proposed in 1977. But due to various reasons, the project was sanctioned only in 1979.

In madurai district, there are more than 100 higher secondary schools offering vocational courses

at the +2 stage. About 20 vocational courses are being offered (list annexed) at present. According to the report of the Director of school Education, more than 20 percent of the students are enrolled in vocational courses in Tamilnadu. The state council of Educational Research and Training of Tamilnadu, with the help of the District vocational officers have conducted some surveys in some of the districts.

The investigator felt that an indepth survey of the district from all angles, namely, needs of the locality, needs of the students, needs of the local industries, projected needs of the district in the next ten years and the preferences of the community would help in the vocationalization pattern to be introduced in the Higher secondary schools of the district.

Moreover, it was felt that an intensive occupational survey was imperative and urgent, as the courses started during 1977-78 in Tamilnadu were not based strictly on employment potential.

The questions to which the Project seeks answers are:

1. What kind of vocationalisation is suitable for the +2 students of Madurai district in

the immediate future?

2. What kind of need-based vocations

can be further introduced at the +2 stage?

3. What kind of self-employment oriented

vocational courses with suitable curriculum can be introduced at the +2 stage?

Thus the project is an attempt to identify such vocational courses which would aim at developing appropriate skills which are significant not only to the students' but to the local, regional, and national needs at large. The project will have the significance of helping students improve their employability or self-employment opportunities in the immediate future.

2.50 BASIC PRINCIPLES OF VOCATIONALISATION.

Education is no longer considered only as a means of developing various faculties of mind obtaining bookish knowledge about the past and the present and enriching one's cultural and ethical values to become a good citizen. On the other hand, it is looked upon as a source of supplying manpower of preparing the posterity for employment in various sectors of the economy. In fact, the quality of

education is being identified with its compatibility for jobs of various descriptions.

UNESCO recommendation on Technical and Vocational Education (1974) states that vocational education is more than technical education and that 'Vocational education embraces those aspects of educational process involving in addition to general education, the study of technologies and related sciences and the acquisition of practical skills, attitudes, understanding and knowledge relating to the occupation in various sectors of economic and social life.'

Vocationalisation of education is a major thrust in the reconstruction of present educational system. Vocationalisation principally aims at equipping the youth with such manual skills founded on basic scientific principles as would be needed in to-day's society and with capacity to adopt to ever-changing scientific and technological developments. Vocationalisation is essentially looked from the point of view of the nation's special needs and goals set by the Government. It envisages an appropriate blend of training in practical skills for the fulfillment of these goals. The chief

principle underlying vocationalisation is that education itself does not produce jobs but vocationalised education makes an individual more employable. Employability is the end-rather-stance of the new system of vocationalised education.

Vocationalisation is looked upon as an effective instrument to prepare middle level manpower who would not merely be superior to skilled workers but who would work with their brains as well as with their hands. The middle level personnel, the target of vocationalised education, would interact with others to produce new goods and services, which may satisfy a long felt need of the community.

Another principal aim of vocationalisation of education is to produce entrepreneurs with special emphasis on agriculture including agro-based and small and cottage industries. Vocationalisation aims at developing in youngsters entrepreneur skills with which they would become creators of jobs for themselves and also for others.

2.60 CHARACTERISTIC FEATURES OF THE +2 STAGE.

The curriculum for the Ten year school. A Frame work (1975) states : "The characteristic

feature of the last two years of school (called higher secondary) is diversification, the aim of which is to avoid forcing the students into the academic channel alone but offer them opportunities to choose subjects and programmes of study in a much wider field of education in keeping aptitudes, interests and abilities, with a view to increase their employability". The new system of education also aims at the reduction and elimination of frustration among the youth resulting from non-productive education offered at present. If the diversification at the +2 stage does not take place effectively, the new system of education would be faced with the problem of having greatly extended tertiary education of academic kind, with consequent expenditure on one hand and the danger of unemployment on the other. The academic stream would cater to not more than 50 percent of the students at the higher secondary level.

Vocational stream is generally terminal. The vocational stream enables the students to become more employment worthy, when they leave the higher secondary. Dr. R.P. Singh (1976) in his article on 'Some Clarifications on Vocational Scheme' clarifies

that the vocational education 'would provide ample opportunity to a child to pursue his inclination and still not lose the chance of attending a college'. Singh points out that the vocational education at the +2 stage is to help the student 'become self-employed' and that "plus 2 is not only a stage in the total educational ladder, it is also a meaningful terminal stage for those who would not go beyond the +2 and would like either to get gainfully employed or enter self-employment".

2.70 OBJECTIVES OF THE PROJECT.

The research project undertaken for the present investigation proposes the following as its specific objectives:

1. To conduct a vocational survey in and around Madurai.
2. To identify and select need-based vocations in which there are opportunities for employment or self-employment either at present or in the immediate future in Madurai district.
3. To develop Curriculum for a set of need based vocations to which the priority is given by the community (i.e: by parents, teachers and students)

2.80 ROLE OF OCCUPATIONAL SURVEY.

The role of occupational survey in the successful implementation of vocationalisation is considered to be essential. The major role of the occupational survey is to identify the emerging industrial, agricultural and commercial development trends in order to assess the employment opportunities responsive to these trends in the near future. The occupational survey aims at identifying the vocation in which there is a shortage of trained personnel and those which offer scope for self-employment. There are various traditional occupations existing in rural, semi-urban areas which require adoption of modern techniques to improve the quantity and quality of their production. Such occupations may also be identified through occupational surveys so that suitable vocational courses can be prepared. The demand for the new skills arising out of various developmental programmes especially in the rural sector will have to be identified carefully to assess the ~~man~~ manpower requirements through occupational surveys.

It is recommended by the experts committee on vocationalisation that the occupational survey should be conducted at the district level preferably by knowledgeable officers and research scholars. It is also suggested that the survey should not rely entirely on available records, but collect as much information as is possible through on-the-spot study, field work, discussions and interviews especially to determine the skill levels and types needed for various vocations.

The method adopted to identify potential areas of occupation through occupational surveys at the district level should be conducted through questionnaires and personal interviews, in order to assess the employment potentials, skills and knowledge necessary for the occupation and types of courses needed to meet these requirements. Such an intensive analysis leads to the formulation of vocational programmes and course objectives. Curriculum areas or components required to achieve the course objectives are drawn up accordingly. The course subjects thus derived are further detailed for teaching and evaluation purposes.

Dr. K. Venkatasubramanian (1976) stresses two precautions in designing and implementing of

vocationalization. They are 1. the course inputs and throughput should be such that the outputs are readily accepted by the employers. Stress on practical activities and shop-floor experience will be helpful in this regard 2. even if the outputs are worthy of employment with best of training, if there is no actual demand in the market for them, vocationalization will not bear fruit. For this man-power planning on the basis of local socio-economic survey is a must. He suggests, though long-term man-power planning is difficult at present, short-term plans on the basis of the existing demand for various posts and careers and the demand for the recent future can be worked out.

Since the society is not static and various dynamic forces are at work, the changes in socio-economic structure are inevitable. It is, therefore, necessary to evaluate the situations through vocational surveys at regular intervals. In short, as the vocational survey is considered to be the heart-throb of the vocationalisation of education at the +2 stage, the vocational surveys, it is recommended, should be a continuous process of assessing the emerging employment opportunities in various potential areas of employment.

2.81. CONSTRUCTION OF TOOLS.

The first and second objectives of the project are to conduct a vocational survey and to identify and select need-based vocations in which there are opportunities for employment or self-employment either at present or in the immediate future in Madurai district.

To achieve these two objectives of the project, an unstructured questionnaire namely VOCATION IDENTIFICATION QUESTIONNAIRE-(VIQ) was constructed in the regional language, Tamil.

The questionnaire was constructed so as to elicit the following vocational information in Madurai district.

1. locality-based vocations
2. development-oriented vocations
3. Resource-based vocations
4. Self-employment oriented vocations
5. employment oriented vocations
6. employment-oriented vocations
7. traditional/family-based vocations.

The Vocation Identification Questionnaire-(VIQ-I) in Tamil version is appended. (Appendix-A))

The second questionnaire called "Vocation Identification Questionnaire-II" (VIQ-II) was developed in the regional language, Tamil. The questionnaire was constructed so as to seek the following information from the industries of Madurai district:

1. job-openings for school-leavers.
2. jobs to which shortage of suitably trained persons.
3. job-training facilities.
4. developmental schemes/activities and expected job-openings.
5. suitable vocation that can be introduced at the +2 stage.

The Vocation Identification Questionnaire-II in Tamil and the translated version are appended. (Appendix-B).

2.82 VALIDATION OF QUESTIONNAIRES.

The vocation Identification Questionnaires were validated by conducting a preliminary vocational survey in few industries, the banks and the public.

2. 83. CONDUCTING VOCATIONAL SURVEY.

The major task of the present project was to identify certain need-based vocations and for which a vocational survey was made in and around Madurai with the Vocation Identification Questionnaires.

The methods adopted in the vocational survey were:-

1) sending mailed questionnaires.

2) personal interviews

3) Field visits.

The people contacted for this survey either through mailed questionnaires or personal interviews were:-

1) Select industrialists.

2) Select Branch managers of State Bank of India, Canara Bank, MDCC Bank, etc.

3) select high and High Secondary School Head masters.

4) Select Panchayat Union Extension Officers.

5) Select village Gramasvaks.

2.84. IDENTIFYING THE VOCATIONS

The vocations identified both through mailed questionnaires and personal interviews in the survey were pooled together. About 40 vocations were identified and they were categorised and the allied vocations were put eight vocational areas namely, i) Paper technology ii) Plastic technology. iii) Ceramic technology. iv) Food technology. v) Leather technology. vi) Mechanical Engineering. vii) Chemical Engineering viii) Miscellaneous.

The list of vocations identified, by conducting vocational survey in and around Madurai were given below:

List of Vocations.

I. PAPER TECHNOLOGY:

1. Card Board from Waste Paper.
2. Handmade paper
3. Paper cups, Saucers and Bags.

(list continued).

4. Paper Decorations(origami)
5. Drinking Straws manufacture.

II. PLASTIC TECHNOLOGY

6. Nylon Buttons Making
7. Polythene Packing Materials
8. Design with Plastics
9. Elastic Arts

III. CERAMIC TECHNOLOGY

10. Pottery
11. Bricks and Tiles
12. Concrete and Cement Works
13. Mosaic Flooring

IV. FOOD TECHNOLOGY

14. Vermicelli Making
15. Soft Drinks/Fruit Beverages
16. Banana Fruit Products

V. LEATHER TECHNOLOGY

17. Finished Leather.
18. Leather Footwear Design
19. Leather Goods Design
20. Leather Tanning
21. Leather garments Design
22. Leather Crafts and Leather Perforation.

VI. MECHANICAL ENGINEERING

23. Aluminium Spinning
24. Stainless Steel Utensils
25. Motor Cycle and Scooter Technology.
26. Tyre Works and Tyre Retreading
27. Wood and Wire Design.

VII CHEMICAL ENGINEERING.

28. Match Industry-Fire Works
29. Bone Meal
30. Soaps and Detergency
31. Camphor Tablets-Candles Manufacture-Tooth Powder Making
32. Cattle-Poultry Feed
33. Distemper, Varnishes and Paints Making.
34. Jasmine Oil Extraction
35. Jewellery and Gold Covering Works and Mirror works.
36. Jewellery and Gold Covering

VIII. MISCELLANEOUS

36. Creative Writing
37. Speech Therapy
38. Fountain Pens and Nibs-Servicing Manufacture
39. Medical Shop Assistant.

2.85 Vocational Choices Inventory (VCI)

The identified vocations were grouped under eight vocational areas as mentioned above and were constructed as a tool called Vocational Choices Inventory(VCI)

The Vocational Choices Inventory included 39 vocations. In the inventory it was instructed that the respondent had to select any three vocations out of thirty-nine and to rank them either first, second or third as the case might be in the order of preference.

The Vocational Choices Inventory(VCI) is appended in appendix (C)

2.90 Sample

The population of this project was the students studying X standard in the Higher Secondary Schools and the higher secondary teachers School teachers and the parents of the school leavers in Madurai district.

A sample of 1000 students in X standard were taken. The sample was a stratified random one. The sample was stratified on sex(male/female) and locality (urban/rural). The sample of students was drawn from 20 higher secondary schools in the district.

Similarly a stratified random sample of 200 higher secondary school teachers were taken. The sample was stratified on sex and locality. The sample of teachers was drawn from about fifty higher secondary schools.

In the same way, a third sample of 1000 parents/ the public stratified on locality was selected. The sample was drawn from Madurai, Melur, Sholavandan, Usilampatti, Thirumangalam and Theni.

2.91 Data Collection.

The Vocational Choices Inventory (VCI) was administered to the samples of students and teachers and parents/the public, in order to identify the most need-based vocations as preferred by them.

Firstly, the Vocational Choices Inventory was administered to a sample of 1000 students studying in X standard to choose three most suitable vocations and rank them in the order of preference.

Secondly, the vocational Choices Inventory was administered to a sample of 200 teachers/Headmasters taking classes for the Higher Secondary Students. They were asked in the Inventory to select three vocations as most need-based and rank them in the order of preference.

Finally, the Vocational Choices of the parents, were collected through the Vocational Choices Inventory. The technique of personal interview was adopted. A sample of one thousand parents/the public placed their preferences in the Inventory.

Thus, the Vocational Choices of the students, teachers, and ~~xxx~~ parents/the public and teachers were collected. Their vocational choices were computed ~~xxxxxxxxxxxx~~ for statistical analysis which is described in the next chapter.

3.00 ANALYSIS AND DISCUSSION.

3.10 PREFERENCES BY STUDENTS.

In this study, a sample of one thousand students both boys and girls studying X standard in the higher secondary schools of Madurai District was administered the Vocational Choices Inventory (VCI). The purpose of the administration of the VCI was to ascertain the vocational preferences of the students. In this Inventory were listed 39 need-based vocations grouped and arranged under 8 different vocational areas.

The sample of students under study was asked to select any three vocations they most like in the Inventory and rank them first, second and third in order of their preference.

The preferences of ~~xxx~~ vocations by the students on the vocational choices Inventory are given in TABLE(1)

TABLE 1. Showing the pattern of Vocational Preference
by the students.

<u>Vocation</u>	<u>Ranking</u>			<u>Total</u>
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	
1	16	3	11	30
2	39	8	7	54
3	46	18	6	70
4	164	34	19	217
5	12	5	6	23
<hr/>				
6	19	13	13	45
7	32	53	40	125
8	20	25	35	80
9	57	29	31	117
10	7	2	6	15
<hr/>				
11	11	34	35	80
12	15	30	36	81
13	15	17	3	35
14	16	11	4	31
15	56	82	21	159
<hr/>				
16	9	17	13	39
17	1	0	2	3
18	2	7	3	12
19	3	3	3	9
20	5	4	3	12
<hr/>				
21	3	5	7	15
22	2	2	7	11
23	12	35	70	117
24	54	85	29	168
25	192	70	73	335
<hr/>				

Contd...

<u>Vocation</u>	<u>Ranking</u>			<u>Total</u>
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	
26	16	23	25	64
27	3	17	16	36
28	30	39	92	167
29	4	10	10	24
30	18	70	57	145

31	10	27	47	84
32	11	29	26	66
33	23	45	62	130
34	6	33	53	92
35	10	35	14	59

36	17	24	31	72
37	13	14	49	76
38	4	7	23	34
39	21	35	12	68

Total	1000	1000	1000	3000

3.20 PREFERENCES BY TEACHERS.

Secondly, a sample of teachers in the higher secondary schools of Madurai district was administered the same Vocational Choices Inventory.

The purpose with which the Inventory administered was to gauge the vocational preferences of teachers.

The teachers constituting the sample of this study were asked to select from the Inventory any three vocations that they considered most suitable for the introduction at the +2 stage, and rank their preference.

The vocational choices of the teachers are given in TABLE(2).

TABLE 2. Showing the pattern of Vocational Preference
by the Teachers.

<u>Vocation</u>	<u>Ranking.</u>			<u>Total</u>
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	
1	8	2	2	12
2	8	3	0	11
3	7	1	2	10
4	11	6	4	21
5	3	1	0	4
<hr/>				
6	8	6	2	16
7	10	7	8	25
8	8	12	18	38
9	9	7	2	18
10	0	1	2	3
<hr/>				
11	5	7	16	28
12	6	10	16	32
13	2	2	2	6
14	8	1	1	10
15	15	20	12	47
<hr/>				
16	2	2	2	6
17	2	1	1	4
18	1	1	0	2
19	1	2	1	4
20	2	1	1	4
<hr/>				
21	0	1	1	2
22	1	4	1	6
23	4	6	10	20
24	9	12	6	27
25	30	20	16	66
<hr/>				

Table Contd....

Ranking.

<u>Vocation</u>	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>Total</u>
26	4	7	3	14
27	1	1	3	5
28	6	8	12	26
29	1	1	2	4
30	5	12	22	39
<hr/>				
31	2	4	2	8
32	5	2	1	8
33	8	13	12	33
34	1	4	4	9
35	1	7	3	11
<hr/>				
36	2	1	1	4
37	1	1	3	5
38	1	2	3	6
39	2	1	3	6
<hr/>				
Total = 200 200 200				600
<hr/>				

3.30 PREFERENCES BY PARENTS AND THE PUBLIC.

Thirdly, a sample of one-thousand parents/ the public in and around Madurai were contacted and interviewed with the Vocational Choices ~~Inventory~~ Inventory to assess their Vocational Preferences.

The Vocational Choices of parents/the public are given in Table (3).

TABLE 3 Showing the pattern of Vocational Preference
by the parents /the public.

<u>Vocation</u>	<u>Ranking</u>			<u>Total</u>
	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	
1	52	9	20	81
2	57	20	15	92
3	37	27	15	79
4	119	41	29	189
5	13	8	6	27
<hr/>				
6	36	20	21	77
7	45	56	52	153
8	26	45	40	111
9	51	29	35	115
10	11	10	1	22
<hr/>				
11	39	57	45	141
12	32	52	42	126
13	7	14	11	32
14	9	17	9	35
15	65	74	40	179
<hr/>				
16	9	24	18	51
17	4	2	2	8
18	3	8	4	15
19	5	7	7	19
20	11	3	4	18
<hr/>				
21	2	5	8	15
22	1	3	2	6
23	17	51	47	115
24	41	62	39	142
25	123	53	70	246

Table contd...

<u>Ranking</u>				
<u>Vocation</u>	<u>1st</u>	<u>2nd</u>	<u>3rd</u>	<u>Total</u>
26	7	15	18	40
27	3	12	14	29
28	34	41	67	142
29	10	20	8	38
30	30	60	87	177

31	6	24	26	56
32	6	22	21	49
33	26	36	67	129
34	8	10	15	33
35	10	12	20	42

36	7	19	13	39
37	7	12	10	29
38	10	8	12	30
39	21	12	40	73

Total	= 1000	1000	1000	3000

3.40. RANKING OF VOCATIONS.

A further analysis of the ranking of the vocational preferences of students, teachers and the public was done.

Only the ranks of those vocations with the highest frequency are given in Tables 4, 5 and 6.

TABLE 4 Showing the Vocational Preferences of students
in Ranks.

Rank	No. of Frequency	Vocation
1	335	Motor cycle and scooter Technology.
2	217	Paper decorations(origami)
3	168	Stainless steel utensils
4	167	Match industry and fireworks.
5	159	Soft drinks and fruit beverages.
6	145	Soaps and detergents.
7	130	Distemper, varnishes and paints making.
8	125	Polythene packing materials.
9.5	117	Aluminium spinning
9.5	117	Elastic arts.
11	92	Jasmine oil extraction.
12	84	Camphor, candles and Tooth powder making.

Table 4 shows only the ranks of the vocations of highest frequency as preferred by students.

TABLE 5 Showing the Vocational Preferences of Teachers
in Ranks.

Rank	No. of Frequency	Vocation
1	66	Motorcycle and scooter Technology.
2	47	Soft drinks and Fruit Beverages.
3	39	Soaps and Detergents.
4	38	Polythene Packing materials.
5	33	Distemper, Varnishes and Paints making
6	32	Concrete and Cement works.
7	28	Bricks and Tiles.
8	27	Stainless steel utensils
9	26	Match industry and Fireworks.
10	25	Nylon button making.
11	21	Paper Decoration(origami)
12	20	Aluminium spinning.

Table 5 shows only the ranks of vocations of highest frequency as preferred by teachers.

TABLE 6. Showing the Vocational Preferences of
parents/the public in Ranks.

Rank	No. of Frequency	Vocation
1	246	Motor Cycle and Scooter Technology.
2	189	Paper Decorations(origami)
3	179	Soft Drinks and Fruit Beverages.
4	177	Soaps and Detergents.
5	153	Polythene Packing materials.
6.5	142	Stainless Steel Utensils
6.5	142	Match Industry and Fireworks.
8	141	Bricks and Tiles
9	129	Distemper Vanishes and Paints making.
10	126	Concrete and cement works.
11.5	115	Aluminium spinning
11.5	115	Design with plastics.

Table 6 shows only the ranks of the vocations of
highest frequency as preferred by the parents and the
public.

3.50 ANALYSIS OF VOCATIONS.

To be highly need-based, a vocation must be uniformly preferred and ranked by the students, teachers and parents and the public. Hence, it is important to find out that there is no or any significant difference among the preferences made for a vocation by the samples of students, teachers, and parents and the public.

About fifteen vocations having higher frequencies of preference by the teachers, students and parents were analysed employing the statistics, 'chi-square' to determine whether the observed frequencies of the three samples differ significantly or not.

It was hypothesized that there would be no difference in the observed frequencies of preferences for a vocation among the three independent samples.

The formula employed to calculate the chi-square value was :

$$\chi^2 = \sum \left[\frac{(O - E)^2}{E} \right]$$

$$\chi^2 = \text{Chi-square}$$

$$\sum = \text{sum of}$$

$$O = \text{Observed frequencies}$$

$$E = \text{expected frequencies}$$

In calculating the chi-square value for about fifteen vocations having higher observed frequencies, twelve vocations of NO DIFFERENCE in the preferences of observed frequencies (acceptance of null hypothesis) among the three ~~am~~ samples identified for curriculum development.

The chi-square calculation for each of the 12 vocations is given in the following Tables (7,8,9,10,11,12,13,14,15,16,17, and 18.)

TABLE 7 Showing the pattern of preferences
for the vocation 'paper Decoration'

Pattern of Preference.

	I	II	III	
Tr	11	6	4	21
St	164	34	19	217
Pa	119	41	29	189
	294	81	54	427

$$\chi^2 = 10.3 \text{ (N.S)}$$

$$P = 0.01 \text{ level}$$

$$df = 4$$

The chi-square value 10.3 shows that there is no difference in the preferences of observed frequencies for the vocation paper decorations among the three independent samples of the teachers, the students, and the parents.

TABLE 8 Showing the pattern of Preferences for
the vocation, 'Polythene Packing Materials.'

Pattern of Preference.

	I	II	III	
Tr	10	7	8	25
St	32	53	40	125
Pa	45	56	52	153
	87	116	100	303

$$\chi^2 = 2.93 \text{ (N.S.)}$$

$$p = 0.01 \text{ level}$$

$$df = 4$$

The Chi-square value 2.93 shows that there is no difference in the preferences of observed frequencies for the vocation 'Polythene Packing Materials' among the three independent samples of the teachers, the students and the parents.

TABLE 9. Showing the pattern of preferences for
the vocation 'Design with Plastics'.

<u>Pattern of Preference.</u>				
	I	II	III	
Tr	8	12	18	38
St	20	25	35	80
Pa	26	45	40	111
	54	82	93	229

$$\chi^2 = 2.70 \text{ (N.S.)}$$

$$p = .01 \text{ level.}$$

$$df = 4.$$

The Chi-square value 2.70 shows that there is no difference in the preferences of observed frequencies for the vocation 'Design with Plastics' among the three independent samples of the teachers, the students, and the parents.

TABLE 10. Showing the pattern of preferences
for the vocation 'Bricks and Tiles'.

<u>Pattern of Preference.</u>				
	I	II	III	
Tr	5	7	16	28
St	11	34	35	80
Pa	39	57	45	141
	55	93	96	249

$$\chi^2 = 11.14 \text{ (N.S.)}$$

$$p = 0.01 \text{ level.}$$

$$df = 4$$

The Chi-square value 11.14. shows that there is no difference in the preferences of observed frequencies for the vocation 'Bricks and Tiles' among the three independent samples of the teachers, the students, and the parents.

TABLE 11. Showing the pattern of preferences for
the vocation 'Concrete and Cement Works'

Pattern of preference.

	I	II	III	
Tr	6	10	16	32
St	15	30	36	81
Pa	32	52	42	126
	53	92	94	239

$$\begin{aligned}\chi^2 &= 4.15 \text{ (N.S.)} \\ p &= 0.01 \text{ level} \\ df &= 4\end{aligned}$$

The Chi-square value 4.15 shows that there is no difference in the preferences of observed frequencies for the vocation 'Concrete and Cement works' among the three independent samples of the samples of the teachers, the students and the parents.

TABLE 12, Showing the pattern of preferences for
the vocation, 'Soft Drinks and Fruit
Beverages'.

<u>Pattern of preference.</u>				
	I	II	III	
Tr	15	20	12	47
St	56	82	21	159
Pa	65	74	40	179
	136	176	73	385

$$\chi^2 = 8.73 \text{ (N.S.)}$$

$$p = 0.01 \text{ level}$$

$$df = 4$$

The Chi-square value 8.73 shows that there is no difference in the preferences of observed frequencies for the vocation 'Soft Drinks and Fruit Beverages' among the three independent samples of the teachers, the students and the parents.

TABLE 13. Showing the pattern of preference for
the vocation 'Aluminium Spinning'.

<u>Pattern of Preference.</u>				
	I	II	III	
Tr	4	6	10	20
St	12	35	70	117
Pa	17	51	47	115
	33	92	127	252

$$\chi^2 = 8.72 \text{ (N.S.)}$$

$$p = 0.01 \text{ level.}$$

$$df = 4$$

The Chi-square value 8.72 shows that there is no difference in the preferences of observed frequencies for the vocation 'Aluminium spinning' among the three independent samples of the teachers, the students and the parents.

TABLE 14. Showing the pattern of preferences
for the vocation 'stainless steel
Utensils'

Pattern of Preference.

	I	II	III	
Tr	9	12	6	27
St	54	85	29	168
Pa	41	62	39	142
	104	159	74	337

$$\chi^2 = 4.68 \text{ (N.S.)}$$

$$p = 0.01 \text{ level}$$

$$df = 4$$

The Chi-square value 4.68 shows that there is no difference in the preferences of observed frequencies for the vocation 'Stainless Steel Utensils' among the three independent samples of the teachers, the students and the parents.

TABLE 15. Showing the pattern of Preferences for
the vocation 'Motor Cycle and Scooter
technology.'

<u>Pattern of Preference.</u>				
	I	II	III	
Tr	30	20	16	66
St	192	70	73	335
Pa	123	53	70	246
	345	143	159	647

$$\begin{aligned}\chi^2 &= 7.37 \text{ (N.S.)} \\ p &= 0.01 \text{ level} \\ df &= 4\end{aligned}$$

The Chi-square value 7.37 shows that there is no difference in the preferences of observed frequencies for the vocation 'Motor Cycle and Scooter Technology' among the three independent samples of the teachers, the students and the parents.

TABLE 16. Showing the pattern of Preferences for
the vocation 'Match Industry and Fireworks.'

Pattern of Preference.

	I	II	III	
Tr	6	8	12	26
St	36	39	92	167
Pa	34	41	67	142
	76	88	171	335

$$\chi^2 = 2.34 \text{ (N.S.)}$$

$$p = 0.01 \text{ level}$$

$$df = 4$$

The Chi-square value 2. 34. shows that there is no difference in the preferences of observed frequencies for the vocation 'Match Industry and Fireworks. ' among the three independent samples of the teachers, the students and the parents.

TABLE 17. Showing the pattern of Preferences for
the vocation 'Soaps and Detergents'
vocation'

Pattern of Preference.

	I	II	III	
Tr	5	12	22	39
St	18	70	57	145
Pa	30	60	87	177
	53	142	166	361

$$\chi^2 = 7.56(\text{N.S})$$

$$p = 0.01 \text{ level}$$

$$df = 4$$

The Chi-square value 7.56 shows that there is no difference in the preferences of observed frequencies for the vocation 'Soaps and Detergents'. among the three independent samples of the teachers, the students and the parents.

TABLE 18. Showing the pattern of Preferences
for the vocation : Distemper, Varnishes,
and paints making.

Pattern of preference.

	I	II	III	
Tr	8	13	12	33
St	23	45	62	130
in	26	36	67	129
	57	94	141	292

$$\chi^2 = 3.4 \text{ (N.S.)}$$

$$p = 0.01 \text{ level.}$$

$$df = 4$$

The Chi-square value 3.4 shows that there is no difference in the preferences of observed frequencies for the vocation : Distemper, Varnishes and Paints making among the three independent samples of the teachers, the students, and the parents.

3.60 NEED-BASED VOCATIONS.

The following vocations were statistically identified that there was no significant difference among the preferences of the three independent samples of the students, teacher and parents. The Chi-square value for each vocation is given in TABLE 19.

TABLE 19: Showing the Need-based vocations and
χ² = value.

S. No.	Vocation	χ ² = value.
1	Match Industry and Fire works.	2.34
2	Design with Plastics	2.70
3	Polythene Packing materials	2.93
4	Distemper, Varnishes and Paints making	3.50
5	Concrete and Cement works	4.15
6	Stainless Steel Utensils Utensils	4.68
7	Motor Cycle and Scooter technology	7.37
8	Soaps and Detergents	7.56
9.	Aluminum Spinning	8.72
10.	Soft-Drinks and Fruit Beverages	8.73
11.	Paper Decorations	10.30
12.	Bricks and Tiles	11.14

4.00 CURRICULUM DEVELOPMENT.

4.10 Meaning of Curriculum

The way we ~~we~~ set about designing curriculum follows logically from what we think curriculum is. The range of meanings given to the concept of curriculum has been one of the sources of confusion in curriculum study. A narrow definition of curriculum means just subject matter or content.

Many writers use the term loosely as being synonymous with 'syllabus', 'courses of study' or even 'time table'.

The definition of curriculum given by Elizabeth Maccia is 'present instructional content' instruction being conceived very specifically as a function of the relation between teacher behaviour and pupil behaviour.

Beauchamp's (1971) working definition is a ' design of a social group for the educational experiences of their children in school.

The more comprehensive meaning given by ~~John~~ Jhon F. Kerr(1971) is ' all the learning which is planned and guided by the school, whether it is carried on in groups or individually, inside or outside the school .

Kerr identifies four interrelated curriculum components- curriculum objectives, knowledge, learning experiences and curriculum evaluation. A simple model of curriculum designed by Kerr suggests four basic questions for use in the construction of a new curriculum. What is its purpose? What subject matter is to be used? What learning experiences and school organization are to be provided?. How are the results to be assessed? The answers to these questions covers the whole gamut of construction of curriculum.

John Kerr identifies three main sources from which curriculum objectives may be derived:

1. information about the level of development of the pupils, their needs and interests
2. the social conditions and problems which the children are likely to encounter
3. the nature of the subject matter and types of learning which can arise from study of subject matter.

4.20. STAGES OF CURRICULUM

Four stages have been identified in the curriculum process, namely: 1. curriculum design, 2. Curriculum development, 3. Curriculum implementation, and 4. Curriculum evaluation. These four stages are the elements of a feedback loop, emphasizing the need for continuous improvement of the system.

CURRICULUM DESIGN

Curriculum design involves establishing job opportunities, listing the activities performed or likely to be performed by the products of the course in different job positions, analysing the knowledge and skills required for performing the activities identified, formulating the course objectives, identifying curriculum areas and course content depending on activity analysis, entering behaviour and constraints in the system, organizing the curriculum, evaluation scheme and working out resources required for implementation.

CURRICULUM DEVELOPMENT

Curriculum development involves designing and developing instructional resources such as teachers' manuals, learning packages, teaching aids, item banks, text-books, and laboratory manuals. It also involves teacher development. All these activities are centred round the objectives and contents identified in the design stage.

CURRICULUM IMPLEMENTATION.

In this stage teaching/learning is effected in the institutions using the instructional resources developed earlier.

CURRICULUM EVALUATION.

In this stage, the curriculum, the instructional resources and the instructional processes are evaluated on the basis of feedback collected from various sources. The evaluation results are fed to the other three elements of the feedback system for improvement.

4.30 In this project, though all the stages of curriculum process could not be carried out, an attempt was made to formulate the course objectives, to identify curriculum areas, course content, teaching aids and suitable reference materials.

In the first place, the list of twelve need-based vocations was sent to the experts in the respective field of vocations in Tamilnadu and other states, seeking their assistance to devise suitable curriculum for the identified vocations.

We ~~sought~~ assistance from the Department of chemistry, ANJA College, Sivakasi; Structural Engineering Research Centre (SERC), CSIR Campus, Madras;

Chemicals and Plastics India Limited, Mettur Dam;
National Institute of Design (NID) Ahmedabad;
National Metallurgical Laboratory Unit, Adayar, Madras;
Central Food Technological Research Institute (CFTRI),
Mysore; Agricultural University, Coimbatore;
Technical Teacher's Institute (TTTTI) Madras;
Central Electro Chemical Research Institute (CECRI),
~~Karaiikudi~~ Karaiikudi; Agricultural College and Research Institute,
Madurai; AGSAR Chemicals, Tuticoria; School of Chemistry,
Madurai Kamaraj University, Madurai; The Enfield India
Ltd, Singampunari; Tamilnadu Polytechnic Madurai;
Madras Aluminium Co. Ltd, Madras and Small Industries
Service Institute (SISI), Madras.

Due to reasons of long distance, lack of
time, non availability of experts on the spot etc, it
was not possible to develop the curriculum for some
of the courses. However, it was possible to get
assistance from the experts only for the following
courses:-

1. Motor-cycle and Scooter technology
2. Soft drinks and Fruit Beverages preparation.
3. Varnishes, Distemper and Paints making.
4. Aluminium Spinning.
5. Stainless Steel Utensils-Making.

The curriculum development work included convening of Curriculum Development Workshop(CDW), in which the experts in the respective field of vocations participated. The list of experts assisted in the project is given in Appendix (D).

Before convening the curriculum development Workshops, it was necessary to have a preliminary meeting as some of the experts had to be given orientation and guidance by the investigator in formulating course objectives, stating them in behavioural terms and identifying the teaching techniques and aids .

The curriculum was developed with due consideration to the existing pattern of the vocational courses at the higher Secondary stage in terms of number of courses, total number of hours for each course, number of hours allotted to theory and practical etc.

The Curriculum Development workshops were held at the following places.

- | | |
|--------------------------|-------------|
| 1. Technical Teachers | Motor Cycle |
| Training Institute(TTTI) | and Scooter |
| Madras-20. | Technology. |
| 2. Small Industries | Aluminium |
| service Institue(SISI) | Spinning |
| Madras-32. | |

3. Small Industries Stainless Steel
service Institute(SISI) Utensils Making
Madras-32.

4. Central Electro Distemper,
Chemical Research, Varnishes and
Institute(CECRI) Paints making.

5. Agricultural College, Soft Drinks and
Madurai. Fruit Beverages
Preparation.

Curriculum objectives, Curriculum content, teaching methods and aids, and relevant reference materials for the five vocational courses were identified in the curriculum development workshops.

A curriculum format was used as a guideline (appended in the Appendix) in the process of Curriculum development. The content validity of the Curriculum developed for the vocational courses were checked by a second set of experts in the related fields, namely, the Home Science Department, Meenakshi college, Madurai, Tamilnadu Polytechnic, Madurai, Chemistry department of T.T.T.I, Madras.

The detailed curricula devised in the workshops for the vocational courses are given in the following pages.

MOTOR CYCLE SCOOTER AND MOPED TECHNOLOGY

1. MOTOR CYCLE SCOOTER AND MOPED TECHNOLOGY

<u>I Year</u>	<u>Hrs./Week</u>	<u>Practical work</u>
1. Applied Physics	2	-
2. Materials & Processes	2	2
3. Workshop Practices	2	6
4. Internal combustion Engines & Electrical systems	2	4
	8	12

Inplant training during summer vacation for 8 weeks.

II year.

5. Transmission & Suspension	2	4
6. Road wheels and brakes, Body work and drawing practices	2	4
7. Shop management and Project work	2	6
	6	14

I. Applied physics.

1. To enable the student to understand combustion problems in an IC. Engines.
2. To enable the student to understand the radiation and other heat losses.

3. To enable the student to study the lubrication characteristics of various lubricants.
4. To expose them to the laws of Thermodynamics.
5. To familiarise the students with air standard cycles.

Thermodynamics--Laws.

6. Air cycles-carno-otto cycle- Diesel cycles, Rankine, Compensation ratio-stroke volume-swept volume-clearance volume air standard efficiency.

7. Efficiency of the above cycles-simple problems.

8. Different types of fuels--knocking

9. antiknock fuels, octane & cetane numbers.

combustion problems in I.C. Engines--time lag--knocking effect of rich lean mixture.

Ignition advances & retard-carburation and principles.

Types of lubrication--wick--gravity--splash.

Self-lubrication-bearing-pressure lubrication-petrol lubrication-Aero dynamic and film lubrication.

qualities of lubricants-grades of lubricants

D.C. machines-alternators-Rectifiers-coupling-standard cables-ISI codes as used in auto wiring. Effect of voltage drop due to resistance in wire and joints-wiring circuits.

Battery charging and maintenance electrolyte-rectifiers

Heat transfer as applied to cooling of engine

Adhesives-Heat insulating materials oil seals and fasteners.

II. Materials and process.

Theory

Practical

Metals and Non-metals used
in auto components-MS, AL,
GM and Brass, Alloys,
High carbon steel,
casehardened steel,
methods of Hardening.

Tempering, annealing, use
of Thermo couples, uses
of Fibre glass, nylon,
plastics.

Ultimate yield stress
tensile stress, shear s
stresses, Hardness,
toughness

Effect of direct loading,
bending and torsional
forces. Furnaces, crucible
use. Tilting, Cupola electric
furnaces. Manufacturing processes,
casting, forging, die-
casting.

use of rubber-vulcanizing
Retrading of tyres

Corrosion in metals-
corrosion prevention-
surface preparation
and finishing of metals.

Heat treatment of metals
preparation of specimen-
Heat treatment-quenching

Testing: Impact Hardness
testing machine, Breinell and
vicker Hardness testing of
metals in UT etc.

Simple hand forging operations.

visits to industries to
study casting, die casting
etc.

III. Workshop Practice

Theory

Hand tools used in fitting-forging-and other shops-gauges calipers- internal micro meters-depth gauges-Dial gauges-cylinder gauges.

Forging operations-drawing out-up setting-swinging of simple components-hexagonal bolts, eye bolts-clamps, Hooks.

Machines of practices

Description of Lathe: operations-turning, facing, taper turning, drilling, boring, thread cutting,

knurling./ Drilling Machine Drilling operation reaming, Drilling reaming-taping operation tapping, use of tapes & dies tools-use of tapes and dyes.

Grinding-Bench grinder-

pedestal grinder-surface

grinder-flexible shaft

grinder- Safety procedures in grinding.

Practice

Exercises in Marking.

Chipping filling-preparation of joints - stud Extraction.

Forging of small components.

Lathe practices.

Grinding of drill bits and other cutting tools-grinding of components surface grinding practice.

Welding&gas cutting: gas welding and cutting-Flame hardening-Electric arc welding-construction and

working of the flame
construction of the
welding torches
construction of the
welding torches

working principles of the
above. colour codes-
preparation of joints-
defects in welded joints
brazing and soldering.

Welding, practice, gas
and Electric arc-gas
cutting.

Practice in brazing& sold-
ering

Visits to industries and
workshops related to
the above--6 visits.

IV. Internal combustion Engines& Electrical systems.

Theory

Theory of I.C. Engines-
construction and working
principle of Two stroke
and 4 stroke of petrol
and Diesel Engines

Petrol Engine two stroke
components construction
details of piston piston
rings, gudgeon pin methods
of locking-connecting rods
and bearings-crank-shaft
bearing-oil seals fly wheel
cylinder head.

construction details of 4
stroke engine-all details as
above plus valves and valve
actuating mechanisms-

Practical

Mechanics tools study.

Dismantelling of two and
four stroke Engines-setting
and assembling of all compon-
ents.

Replacement of rings-boring
and reaming of cylinders and
lappings

~~Check~~

Valve grinding and valve seat
cutting, checking work bear-
ings and other components

Dismanteling and setting of
carburetors.

decompressor-valve clearance
and its purpose.

Carboretter-types-Amal villiards
purpose and construction details
and working

Cleaning and setting spark
plug-Running and Testing
of Engine.

multicylinder Engines and multi
carboretters

Diesel system, Fuel injection
-ion pumps and nozzles-dismantling
-ling assembling of the above-set
-ting and testing-calibration of
-the pumps-fuel system-troubles
causes&Remedies.

Engines troubles-causes and
remedies.

Constructional details of 2
stroke petrol engines.

Dismanteling magnetic coil-
study-testing of the above
and reassembly

Diesel Engine, Fuel injection
system and nozzles-trouble
shooty & calibration of
pump.

Removal, checking, cleaning
and assembly of contact
Breaker and condenser and
setting.

Electrical system

coil and magneto Ignition,
systems contact Breaker,
condenser-changing system
and construction details
lighting system rectifier.

Dismanteling and assembling of
lub oil pump-Testing of the systems

Electronic Ignition systems.

Pipe joints-pipe bending and flarin
of tubes-unions.

Lubrication methods of
lubrication in two and four
stroke engines-oil pump
construction-filters grade
of lubricating oil and
grease

Lubrication faults causes
and remedies.

/ Transmission.

Clutch-purpose types of
clutches-Multiplate wet
type centrifugal-friction
materials construction
details of various types
Clutch operating system

Dismantling, inspectio and assembly
of Clutch faults, causes&remedies
clutch control system &service.

purpose types-sliding mesh,
constant mesh and synchromesh.
Epicyclis.
construction and operation of
the obver gear shift mechanism.

Transmission troubles, causes
and remedies.

Dismantling& inspection
and assembly of all
components-checking back
bash

Inspection and removal&
replacement of bearnings.

Gear shift levers dismantling
and assembling.

Drive line

Chain drive, shaft drive and
joints sprockets& chain
covers

Chains& ~~shaft~~drive shaft
service and lubrication and
assembly Adjustment of chain
Inspection of sprokets and
replacement.

Suspension

Shock absorbers-purpose-
construction details and
workings types-hydraulic
gas filled-suspension
bushes and springs spring
testing and inspection
suspension system troubles
causes and remedies.

Dismantling of schock
obsorbers Reconditioning
and assembly. Testing
of springs and replacement.

✓1) Road wheels-brakes

Body fram& driving practice

Bracking system-Brake drum construction details-brake shoe construction-cams-brake lining materials and construction-Brake control and actuation mechanism, Brake troubles causes and remedies. Hydraulic brakes Brake testing safe braking distances./ Frame head bearings frame testing Turist distortion and rectification mud guards and body construction and seats. Road wheels

Rims, spokes, construction and mounting split rims.

typer-construction details removal and replacement of tyres and tubes.

Tyre service vulcanizing-Retreading of tyres. Static&dynamic balancing of wheels.

Disnantling of brake drums and its components. replacement of brake lining replacement of cams&bearings.

Hydraulic brake system.

Brake testing and inspection.

Inspection&testing of frames

Rectification of bends

Linkering work rust proofing &painting.

Rimsetting

Driving practice 20 hrs.

Vulcanizing.

visits to industry.

VIII) Shop management and project workshop

Theory

Project work

selection of site-lay out of shops shop acts and factory acts-Banking procedures.

feasibility study and locality survey.

Estimation of tools and equipments and furniture required. service facilities available from allied industries Estimation of salaries and wages-incentive and over time. welding Machine shop-painting

Stores management-procurement Spares availability
storage-basic inventory control

Job estimates-cost of labour-
overhead-cost of spares-
profit.

Survey of prevailing
market rates for

1 to 8 (in theory) and
Painting, Retreading.

Estimation of time for various
jobs:

1. Engine tune up and service
2. Cleaning and setting
carboretter-CB points
ignition timing
3. Replacement of control
cables-clutch, accelerator,
brake speedometer.
4. Brake adjustment and repair
5. De carbonizing engine
6. Decarbonising Exhaust
system
7. Major Engine overhaul
8. Repare of transmission
system and drives.
9. Banking procedures-
Book keeping single
entry&Double entry.

Preparation of
Project work(study of
item No.1 to 8 in the
laboratory)

CURRICULUM FOR VOCATIONAL COURSE+2 STAGE ON PAINT,

4,50

VARNISH MAKING AND DISTEMPERS Ist year.

Paper No. 1.

Drying oil, Rosin, Natural Resin and Shellac
Used in Paint Industries

1. Linseed oil
2. Tung oil
3. Perilla oil
4. Soyabean oil
5. Oiticica oil
6. Fish oil
7. drying oil-Chia oil, Hempseed oil Poppy seed oil, sun flower seed oil etc.
8. Dehydrated castor oil.

1. Chemistry of drying oil
2. Manufacture of drying oil
3. Refining of drying oil
4. Application of drying oil
5. Mechanism of drying
6. Properties of drying oil

70 periods

Test and specification II

Cashew nut shell liquid

1. Chemical history of cashew nut shell liquid(CNSL)
2. Production of CNSL.

II. Rosin

1. Methods of production(Gum rosin, Wood rosin)
2. Chemistry of rosin acids

3. Structure of rosin acids
4. Chemical reaction of rosin acids
5. Properties of rosin and derivatives
6. Uses/application of rosin 20 periods

III. Natural resin for the ~~xx~~ paint and Vanish industry

1. Classification of natural resins
2. Damers-low acid number resins of recent origin,
solvent and oil soluble.
3. East Indias-Semi-Fossil or semi recent resins related
to the damers, solvent and oil soluble.
4. Copals-Higher acid numbers than damers
5. Miscellaneous resins.
Preparation, properties and application 20 periods.

IV Shellac and other lacs

1. Historical
2. Chemistry of shellac
3. Shellac varnish
4. Application of Shellac
5. Button lac, Bleached lac, Garnet lac. 10 periods.

Total 120 periods

Paper No. II

Pigment/Extenders used in paint industries

1. Chromate pigments(10 nos)
2. Red lead pigments
3. Zinc phosphates, Barium phosphates, Manganese phosphates
4. Iron oxide(Red)
5. Oxides of metals
6. Soap stone
7. Barytes
8. Talc
9. Diatomaceous earth
10. Metal powder pigments, Zn, Mn, Pb, Ag, Al.

1. Methods of preparation of pigment
2. Physical and Chemical properties of the pigment
3. Method of testing of the pigment.
4. I S specification for various pigments used in paint.
5. Uses of this pigment in different paint.

140 periods.

Paper No. III

Solvent, Plasticizers and organic pigments.

1. High solvent naphtha
 - i) Mineral spirit
 - ii) Toluene
 - iii) Xylene
 - iv) White spirit
 - v) Ethyl acetate
 - vi) Isopropyl acetate
 - vii) Methyl Ethyl Ketone
 - viii) Methyl isobutyl ketone

ix)

2. Methods of preparation, properties and chemical composition of the above solvent.
3. Testing and evaluation (Sp. Colour, Evaporation rate, Flash point and distillation range)
4. Plasticizers--Type of Plasticizer.
 - a) Natural (Castor oil)
 - B) Synthetic use of plasticizer in paints.

Organic pigments:

1. Chemistry of colour and constitution
2. Dyes and pigments having nitro and nitro groups
3. Dyes and pigments having azo groups.
4. a) Natural (castor oil)
b) Synthetic use of plasticizer in paints.
4.
 - a) Red pigments
 - b) Orange pigments
 - b) Yellow pigments
 - d) Maroon pigments
5. Lakes and toners
6. Methods of test for organic pigments.

100 periods.

II nd Year

Paper No. 4

Synthetic resins

1. Chemistry of polymer and polymer reaction:
 - a. Classification
 - b. Polymer Reaction, Condensation, addition Polymerisation and their difference.

- c. Poly condensation reaction.
- d. Addition Polymerisation
- e. Mechanism.

- a. Initiation
- b. Propagation
- c. Termination
- d. Chain transfer
- e. Inhibition and retardation

Configuration and practical properties of
Polymer molecules in dilute solution.

Synthetic resins:- Classification-Preparation, Properties.

1. Condensation polymers

- a. Phenolic resins
- b. Ammo resins
- c. Alkyds
- d. Unsaturated polyesters
- e. Epoxy resins
- f. Polyurethane
- g. Silicones.

2. Addition polymers:

- a. Polyvinyl acetate
- b. Poly vinyl alcohol/acetal
- c. PVC and Vinyl chloride co polymers
- d. Polystyrene and styrene copolymers
- e. Acrylic resins.

3. Nitro cellulose lacquers

4. Chlorinated rubber

5. Bitumin and coal tar based composition.

Methods of preparation, physical and chemical properties
of the above resins.

120 periods.

Paper No. 5.

Preparation of paint and testing.

1. Additives used in paint coatings.

- a. Driers
- b. Wetting and dispersion agents.
- c. Anti skinning agents
- d. Anti settling agents.
- e. Antifloating and flooding agents.
- f. Flow control and levelling agents
- g. Deforming agents
- h. Res. w. s. and fungicides
- i. Anti rouling pigments.

2. Principle of paint formulation

3. Mixing, grinding and dispersion of pigments ~~of~~
equipment used and other details for the preparation
of paint.

4. Thinning, additives added, storage and packing

5. Application and properties

6. Testing of liquid paint IS 101

7. Distempers-a) Dry (b) Paste

8. Raw materials and manufacture of distempers

100 periods.

Paper No. 6

Different types of organic coatings used in various
materials and various environments, properties and
evaluation of paint.

Protective schemes-Primers, under coat, finish paint,
methods of surface preparation and methods of application.
Paints for ferrous metal paints and non ferrous metals
paint used in marine environments. Paints used in industrial
environments. Coatings for wood and concrete. Special
type of coatings used for

1. Air craft and (Transport, Rail, Bus)
2. Nuclear reactor
3. Satellite
4. Solar collectors
5. Leather finishes
6. Road
7. Luminescent paint
8. Fire resistant paint
9. High temperature resistant paint
10. Water based coatings and electrodeposition of paints
11. Conducting paints.
12. Temperature indicating paints
13. Temperature indicating paints
14. Anti-fouling paints
15. Mould resistant coatings
16. Physico-chemical properties of organic coatings.
17. Modern technique for analysis and testing of paints

140 periods.

Practicals for Ist year.

Physical properties of varnishes/pigments.

Paper I

1. Specific gravity
2. Saponification value
3. Acid number
4. Iodine value(wigs)
5. Acetyl value
6. Mean molecular weight
7. Viscosity
8. Melting point/Boiling point
9. Diene value((Maufmann))
10. Ash content
11. Gelation time
12. Acetone number
13. Drying time determination
14. Solubility with solvent
15. Evaporation rate.
- 16.

Paper 2.

16. Oil absorption of pigments
17. Analysis of pigments for their constituent
(Valumetric gravi metric, coloury metric etc).

Practicals for II Year.

Paper 5

18. Paint preparation
19. Testing liquid paints
 - a. Viscosity
 - b. Specific gravity
 - c. Drying time

- d. Fineness of grind
 - e. Flow and leveling properties
 - f. Hiding and spreading power
 - g. Thickness of wet film.
20. Light fastness, Resistance to heat, Resistance to acid, alkali, capacity, bleeding in water and oil.
21. Hiding power
22. Particles size and shape
23. Bulking value.
24. Testing of painted panels
- a. Adhesion
 - b. Thickness
 - c. Corrosion resistance tests
 - d. Impact tests
 - e. Thickness test.
 - f. Coverage tests
 - g. Abrasion tests
 - h. Tensile strength, flexibility elongation
 - i. Durability.

Paper 6.

25. Surface preparation+ pickling sand blasting, wire brushing etc.
26. Methods of application
27. Modern techniques for analysis and testing of paint materials (Demonstration Teacher activity).
- a. Gas liquid Chromatography (GLC)
 - b. Ultraviolet spectrography
 - c. Infrared spectroscopy.
- {practicals) -- 1-15- may be repeated for paper IV in the 2nd year.

visit to paint industry-- may be included (near
Tirumangalam).

Books for Paint, Varnish and Distempers.

1. Noel Heaton "Outline of Paint technology", 1956.
2. Dean and H Parker. "Principle of surace' coating technology", 1965.
3. Elias Singer " Fundamentals of Paint, varnish and lacquer technology", 1957.
4. Norman, I. Gaynes " Formulation of organic coatings", 1967.
5. N F Payne, " Organic coating technology" Vol. I, Vol II.
6. A G Roberts " Organic coating-properties, selection and use ", 1968.
7. Nylon T and Sundarland " Modern surface coatings" 1965
8. I S Specification & ASTM Standards for paint and Varnish testing.

4.60. Name of the course : Fruit Beverages/Soft Drinks.

The Title of the Vocational Subjects:

I year

1. Bio Chemistry.
2. Fundamentals of Nutrition
3. Chemistry of Horticultural Products
4. Principles of Fruit Processing.

II Year

1. Food Micro-biology
2. Technology of Fruit Processing
3. Manufacture of Soft Drinks/
Fruit Beverages
4. Quality control and marketing.

Ist Year

1. Bio-Chemistry

Introduction to Carbohydrates, Proteins, lipids, metabolism, vitamins, minerals, enzymes, pigments, tanning, hormones, alkaloids.

2. Fundamentals of Nutrition

Role of Carbohydrates, Protein, lipids, vitamin and minerals and trace elements in human nutrition--energy requirement chemistry and function of digestion, absorption, utilization, requirement, deficiency sources and preventive measure.

3. Chemistry of the horticultural products.

History and importance of Horticulture-role of Horticultural products in human nutrition-raw materials nutritive value of Fruits chemistry, texture, chlorophyll, carotenoids, flavour components, -changes in post-harvest technology-post harvest treatment-pre-cooking waxing-fumigation, irradiation-freezing-handling of the products.

4. Principles of Fruit processing.

Importance and scope of fruit process industry principles and Guidelines for the location lay out for principles and techniques and equipment for canning-metal-gases and plastic container--principles of processing by use of salt-sugar-use of preservatives-Additives and preservatives use of enzymes,-clarification of fruit juice-Tomato products.

II Year.

Role of micro-organism in nature, Discovery of micro-organisms-Relative position of bacteria, actions myceteics, yeast, Fungi, algae, and viruses.

-decomposition organic matter -Nitrogen cycle-importance of micro in food and Food products-Fermentation-Industry-Fruit spoilage:-

micro organisms involved in different types of fruits, dry fruits, and bottled products. Sanitation Food poisoning-Food infection-control of these organism in food and food products-principle, techniques and equipments and dehydration.

2. Technology of Fruit processing

Preparation of juices: squashes: syrups: concentrates; cordial; fruit preserves; condenses; crystallised fruit; fermented juices; wine; vinegar; canning of fruits; sulphiting of fruits; leather.

3. Manufacturing of Soft Drinks/Fruit Beverages

Use of enzymes; juice concentrates-development of Beverages, carbonation soft drink mixtures; bottling and carbonation concentrate-powder; paste; tablets; Tamarind juice; ginger drinks;

4. Quality control and Marketing.

Quality control; changes in nutrients while preparation and processing; standards preserved by ISI; spoilage of fruit products; out-out analysis; colours and Food loss, Akmark, Fruit product order; colour; Additives by-products; utilization of waste by-products and waste from processing industry; packaging; storage; marketing and consumer economics.

- - - - -

COURSE: ALUMINIUM SPINNING AND STAINLESS
STEEL UTENSILS.

4.70 I Year

Subject	Period per week			Total for 36 weeks or one year.
	<u>Theory</u>	<u>Practical</u>	<u>Total</u>	
1. Basic Metallurgy limited to Alumi- nium&stainless enumerating the salient proper- ties.	7	-	7	252
2. Specific pro- perties on alumi- nium and stainless steel that make them useful for spinning and drawing process.	7	-	7	252
3. Machinery for aluminium spin- ning&Stainless steel drawing, selection and other characteri- stics.	6	-	6	216
Total				720

4. Desing of spin- ning tools and spinning opera- tion.	3	4	7	252
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5. Theory of metal finishing and practical aspects.	3	4	7	252
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6. Testing -fault finding ISI stand- ards, Export speci- fications	3	3	6	216
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Total				720
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NOTE:

In the first year no specific period for practicals have been referred to, considering the difficulties in possessing a laboratory for metallurgy study etc. However the students can be taken to the Regional Testing Centre, Engineering College and Tamilnadue Polytechnic where tests and demonstrations for understanding the properties of aluminium and stainless that make them popular utensil materials may be arranged.

In the practical for spinning and metal finishing subject, arrangements with equipments have to be made. Once the general principle of the syllabus is accepted, the necessary plan for these things can be drawn out.

5.00 Public Opinion Survey.

The 10+2+3 pattern of education was introduced with the specific aim of making students more employment-worthy through vocationalisation of the +2 stage. It was expected that this stage would integrate academics with vocationalism, relate the world of education with the world of work, prepare middle level man power who would work with their brains and hands, and produce entrepreneurs who would become creators of jobs for themselves and for others.

It was also hoped that if a wide range of vocational courses was provided at the two year block of higher secondary stage, a fair proportion of students would be diverted from rushing to colleges and crowding in the universities.

Vocationalisation was introduced at the higher secondary schools in Tamil Nadu from the academic year 1978-79. The first batch of the +2 students have come out and the investigator felt that it would be appropriate to undertake a public opinion survey with a view to assessing how far the expectations and hopes were being fulfilled in the new system of education.

5.10 Objective of the survey

The major objective of the opinion survey was to find out the reactions of students, teachers and parents, industrialists and the public towards the working and efficiency of vocationalisation at the +2 stage in the higher secondary schools of Madurai district.

5.20 Construction of Tool

A check list was constructed to gauge the opinion^{of} the student, teacher and the public. The checklist included questions on the student's assessment on the vocational stream, his future career plan, whether he has developed confidence for self-employment whether he is going to seek employment or pursue higher education in colleges etc. The check list is appended in appendix(.....)

The check list was validated by conducting a pilot study in a few schools and contacting some enlightened people among the public.

5.30. Data collection.

The survey was conducted on a sample of one hundred vocational stream students who had just completed the + 2 course, and a sample of sixty teachers who had the experience of handling classes for the vocational

stream students, and a sample of one hundred enlightened public persons including industrialists and the parents of the students.

The three samples were required to express their reactions to and opinions on the vocational stream of the Higher Secondary stage.

5.40 Analysis and Discussion

Firstly, Percentage was calculated to assess the opinions of the respondents (students) on vocational stream of the higher secondary stage.

It was found that only 15 per cent of the students opined to set up their own workshops/factories/industry after completing the vocational stream.

Another 15 per cent of the students expressed their opinion of seeking employment in the private/public enterprise.

It was found that about 40 percent of the vocational stream students expressed their opinion on applying to Arts/science and professional colleges.

Only 15 per cent of the students expressed their confidence of creating employment for themselves.

It was found that about 60 per cent of students felt that they could not get the capital necessary for setting up their own business/factory.

About 65 per cent of the vocational stream students wished to do an advanced course in the specialization they had just completed.

The responses of the teachers and the public were analysed and it was found that only 20 per cent of the teachers and the public expressed their opinion that the students had been trained adequately to start their own business independently and to join any public/private enterprise straightaway.

Only 25 per cent of the teachers and the public expressed their opinion that the vocational stream of the higher secondary stage had developed confidence in students to create an employment for themselves and others.

About 55 per cent of the respondents felt that the vocational stream of the higher secondary stage could be better extended to the + 3 stage at the college level.

65 per cent of the teachers and the public considered the vocational stream to be more suitable for less able students and the academic stream suitable for better students.

From the foregoing analysis of the opinions of the students, teachers and the parents and the public we can suggest that:-

1) more emphasis should be laid on imparting the students with the occupational skills that are necessary for them to set up their own workshops/factories or to seek employment in the private or public enterprise.

2) most of the students prefer Arts/science/professional colleges because of the lack of provision of the facilities for the students to do an advanced course in the specialization they had just completed. Hence we can suggest that vocationalisation at the +2 stage must be extended to +3 stage also.

3) lack of finance or capital seems to be a serious handicap to the students for setting up their own business/factory. Therefore more on basis on practical knowledge regarding application of bank loan, obtaining license, permits etc to start an industry independently should be included in the curriculum of the vocational stream.

iv. There is a general opinion among all people that vocational stream is more suitable for less able students and the academic stream for better students. ~~parity~~ of esteem of the courses must be impressed upon the people and the students by selecting students on the basis of aptitude, intelligent and ability tests.

6.00 Summary and Conclusions.

Vocationalisation was introduced at the higher Secondary schools in Tamil Nadu from the academic year 1978-79.

During the initial period of the implementation of Vocationalisation in different states, it was found in the study conducted by the NCERT that 'unsatisfactory Pre-implementation preparation' as one of the major problems which called for urgent attention. In this regard, it was recommended that a closer linkage should be established between the economic activities and the educational programmes to make the vocational courses more successful. It was also recommended that in order to ascertain the employment potential and occupational patterns suitable for jobs, a quick but meaningful occupational/ vocational survey should be conducted in each district to identify suitable vocations relevant to the district in particular and useful to the country in general. This was the context in which the project was proposed in 1977. But due to various reasons, the project was sanctioned only in 1979.

The investigator felt it necessary that an indepth survey of the district from all angles, namely needs of the locality, needs of the students,

needs of the local industries, projected needs of the community, the district in immediate future and the preferences of the community would help in the vocationalization pattern to be introduced in the higher secondary schools of the district, as the courses started in the district during 1977-78 were not based strictly on employment potential.

6.10. Objectives

The project was undertaken with the objectives of 1) to conduct a vocational survey in and around Madurai. ii) to identify and select need-based vocations in which there are opportunities for employment or self-employment either at present or in the immediate future in the district, and iii) to develop curriculum for a few need-based vocations to which the priority is given by the community i.e. the parents, teachers and students.

6.20. Methodology/procedure

An unstructured questionnaire namely Vocation Identification Questionnaire- I (VIQ) was constructed for conducting a vocational survey in and around Madurai.

The questionnaire sought the following information in Madurai district. i) locality-based vocations. ii) development-oriented vocations. iii) resource-based vocations iv) self-employment oriented vocations. v) private employment oriented vocations. vi) traditional/family-based vocations

Another unstructured questionnaire called Vocation Identification questionnaire -II (VIQ) was also constructed to collect information from the small and large scale industries of Madurai district.

The questionnaire sought the following information from the industries of Madurai district. i) job-openings for school-leavers. ii) jobs to which shortage of suitably trained persons. iii) job-training facilities iv) developmental schemes/activities and expected job-openings for school-leavers. v) suitable vocation that could be introduced at the +2 stage.

6.21 Validation

The two questionnaires were validated ^{for} the vocational survey by conducting a preliminary survey in a few areas of the district.

6.22. Vocational survey:

The methods adopted in the vocational survey were:-

i) personal interviews ii) sending mailed questionnaires and iii) field visits.

The people contacted for this survey either through personal interviews or mailed questionnaires were:-

i) select small scale industrialists. ii) select large scale industrialists. iii) select Branch Managers of State Bank of India, Canara Bank, MDCC Bank, etc. iv) select High and Higher Secondary School Headmasters. v) Select Panchayat union Extension officers. vi) select village Gramsevakas. vii) Businessmen and unlightened people in the society.

6.23. Vocational Choices Inventory(VCI)

A vocational Choices Inventory(VCI) consisting of 39 vocations identified in the survey and grouped under eight occupational areas, was constructed. The Inventory was administered to a sample of 1000 students studying X standard, and another sample of 200 teachers in the vocational stream and yet another sample of 1000 persons of the public including parents, industrailists, and businessmen, and enlightened people in the society.

The respondents of the three-samples, students, teachers and the public/parents were required in/ the Inventory to select any three vocations out of thirty-nine and rank them either first, second or third in the order of their preference.

6.30. Statistical Analysis:

About 15 vocations having higher-frequencies of preference among the students, teachers and the public/parents were analysed employing the statistics, chi-square to determine whether the observed frequencies of the three samples differed significantly or not.

It was hypothesized that there would be no difference in the observed frequencies of preferences for a vocation among the three independent samples.

In calculating the chi-square value for 15 vocations having higher observed frequencies, 12 vocations of No difference, in the preferences of observed frequencies (acceptance of null hypothesis), among the three samples were statistically identified for curriculum development.

6.40. Curriculum development

In the phase of curriculum development work, an attempt was made to identify the experts for developing curriculum for the twelve need-based vocations identified statistically significant in the project.

Due to reasons of long distance, lack of time, non-availability of experts on the spot etc, it was not possible to develop the curriculum for some of the vocational courses.

However, it was possible to get assistance from the experts for five vocational courses. The curriculum development work included convening of Curriculum Development Workshops(CDW), in which the experts in the respective field of vocations participated.

Before convening the Curriculum Development Workshops, a preliminary meeting with the experts was arranged and some of experts were given orientation and guidance by the investigator in formulating course objectives, stating them in behavioural terms and identifying the teaching techniques and aids.

The curriculum was developed with due consideration to the existing pattern of the vocational courses at the higher secondary stage in terms of number of subjects/courses, total number of hours for each course/subject and number of hours allotted to theory and practicals, etc.

In the curriculum development work, though all the stages of curriculum process namely curriculum implementation and curriculum evaluation could not be carried out, an attempt was made to formulate the course objectives, and to identify curriculum areas, course content, teaching aids and suitable reference materials.

6.50. Findings of the Vocational Survey

1) The twelve need-based vocations identified in Madurai district were: i) Match industry and Fire works. ii) Design with plastics iii) Polythene Packing Materials iv) Distemper, Varnishes and Paints making v) Concrete and Cement works vi) Stainless Steel Utensils vii) Motor cycle and Scooter Technology. viii) Soaps and Detergents. ix) Aluminium Spinning x) Soft drinks and Fruit Beverages xi) Paper Decorations xii) Bricks and Tiles. 2) Curriculum was developed for five vocational courses. They were : i) Aluminium Spinning ii) Manufacture of Stainless Steel Utensils. iii) Distemper, Varnishes and Paints Making iv) Motor cycle and scooter technology and v) soft drinks and Fruit Beverages.

6.60. Opinion Survey

Towards the end of the study, as the first batch of the +2 students in Madurai district had just come out of the vocational stream, the investigator felt it necessary and appropriate to undertake a public opinion survey with the view of assessing how far the expectations and hopes with which vocationalization was introduced, were being fulfilled in the new system of education.

An opinions checklist was administered on a sample of one hundred vocational stream students who had just completed their +2 study, and another sample of sixty teachers who were handling the vocational stream classes and yet another sample of one hundred public persons including parents, the industrialists and the business people.

6.61. Findings of the opinion Survey.

1. Only 15 percent of the students expressed their opinion that they were going to set up their own workshops/factories/industry after completing the vocational stream.
2. About 25 per cent of the students expressed their opinion of seeking employment in the private/public enterprise.
3. 40 percent of the vocational stream students said they intended to apply to Arts/Science or professional colleges after the completion of the +2 study.
4. 65 per cent of the Vocational stream students wished to do an advanced course in the specialization they had just completed at the +2 stage.
5. Lack of finance or capital seemed to be a series handicap to about 60 percent of the vocational stream students for setting up their own business/factory.

6. Only 20 percent of the teachers and the public expressed their opinion that the students had been trained adequately to start their own business independently and to join any public/private enterprise straightway.

7. About 55 per cent of the respondents of the teachers and the public felt that the vocational stream of the higher secondary stage could be better extended to the + 3 stage also at the collegiate level.

8. 65 percent of the teachers and the public considered the vocational stream to be more suitable for less able students and the academic stream suitable for better students.

6.70 Conclusion.

The investigator realizes that only one batch of students have gone through the vocational stream and the concept of vocationalization itself is not fully accepted by all people, and that we are going through a transitional stage in the process of vocationalization. Hence any kind of assessment or evaluation of the system is not really proper. Still the investigator was tempted to undertake a public opinion survey with the intention that such an opinion survey would throw some light on the working of the vocational stream from the point of view of students, parents and the public and that this would help in deciding the future pattern of vocationalization.

The project has indicated at least twelve vocational courses suited to the district of Madurai. Curriculum has been developed for five of these courses. The investigator wishes that the NCERT, New Delhi would direct the SCERT and the Director of School Education, Madras, to consider introducing these courses in a few higher Secondary schools of Madurai district and training the teachers suitably in these vocational courses.

The NCERT may organize curriculum development workshops for the other courses identified by the project ~~and~~ for which the investigator has not been able to develop the curriculum.

The investigator suggests that periodical public opinion survey may be undertaken on a larger sample to find out the changing needs of the society.

Restructuring of the +3 stage is being undertaken by the universities to include job-oriented/ job motivated courses. At this juncture, the universities would do well by being aware of the needs and demands of the community as well as the projected industrial trends of the locality.

Some advanced and specialized vocational courses building on the vocational courses offered at the +2 stage could be included at the +3 stage. Some diploma, certificate Post higher Secondary vocational courses may be offered either in the polytechnic or in the technical institute.

The investigator wishes that similar surveys may be undertaken in other districts of Tamilnadu so that the higher Secondary vocational stream of each district meets the needs and demands of the local people and local industry.

Finally, the investigator recommends that a cell for occupational research and curriculum development be set up at the state level for collecting data on occupational needs and occupational pattern of the workforce for the whole state. Since man power and development needs differ according to the different areas within the state, planning at the district level is an important aspect of planning for vocationalization. Hence District level educational cells affiliated to the State cell should be responsible for Planning for vocationalization at the district level.

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APPENDIX - A
தொழில் அடையாளங் காணல் திரல்
(VOCATION IDENTIFICATION QUESTIONNAIRE)

பெயரும் முகவரியும்: ..

வேலை / தொழில் ..

தாலுகாவின் பெயர் ..

1. தங்கள் பகுதியில் பெருமளவில்
நடைபெறும் முக்கியமான தொழில்களின் பெயர்களைக் குறிப்பிடுக. (உ-ம்) பிஸ்கட் தயாரித்தல், தீப்பெட்டி தயாரித்தல், மரபொம்மைசெய்தல், தூவகஞ்சு சாயம்போடுதல், வேட்டி/சேலை நெசவு, பிரம்பு நாற்காலிசெய்தல், சிமின்ட் ஒர்க்ஸ் போன்ற சிறுதொழில்கள்)
 - 1.
 - 2.
 - 3.
2. தங்கள் பகுதியில் அடுத்த 5-10 ஆண்டுகளில் புதிதாக மலரக்கூடிய (emerging) அல்லது வளர்ச்சி அடையக்கூடிய (developing) தொழில்களின் பெயரினைக் குறிப்பிடுக.
 - 1.
 - 2.
 - 3.
3. வளத்தினை (Resource) அடிப்படையாகக் கொண்டு தற்பொழுது தங்கள் பகுதியில் பெருமளவில் நடைபெற்றுவரும் தொழில்களின் பெயர்களைக் குறிப்பிடுக.

(உ.ம்: வளம் - தொழில்)

1. திராட்சை	பழரசபானங்கள்
2. சுண்டம்புகைல்	சாக்பீஸ் உற்பத்தி
3. ஏரிகள்	மின்பிடித்தல்
4. மல்பெரி (Mulberry)	பட்டுத்தொழில் (Sericulture)

வளம் (Resource) - தொழில்

 - 1.
 - 2.
 - 3.
4. வளத்தினை (Resource) ஒட்டி அடுத்த 5-10 ஆண்டுகளில் தங்கள் பகுதியில் எந்தெந்த தொழில்கள் புதிதாக மலர்வதற்கான வாய்ப்புகள் உள்ளன?
 - 1.
 - 2.
 - 3.
5. தங்கள் பகுதியில் நடைபெறும் சுயவேலை வாய்ப்பு (Self-employment oriented) தரக்கூடிய தொழில்கள் யாவை?

(மை தயாரித்தல், மெழுகுவர்த்தி தயாரித்தல் முதலியன)

 - 1.
 - 2.
 - 3.
6. தங்கள் பகுதியில் அடுத்த 5-10 ஆண்டுகளில் என்னென்ன சுயவேலை வாய்ப்புத் தரக்கூடிய தொழில்கள் மலரலாம் எனக்கருதுகிறீர்கள்?
 - 1.
 - 2.

7. தங்களது பகுதியில் பரம்பரை / 1.
 குடும்பப் பழக்கமாக செய்யப்
 பட்டுவரும் முக்கியமான தொழில் - 2.
 களின் பெயர்களைக் குறிப்பிடுக.
 (உ.ம்: தங்க நகை செய்தல் 3.
 (Goldsmith)
8. தங்களது பகுதியில் அனுபவ அடிப்படை 1.
 யில் (by experience)
 முறையான பயிற்சி இன்றி (No scienti- 2.
 fic training) செய்யப்பட்டு
 வரும் தொழில்கள் யாவை? 3.
9. தங்களது பகுதிக் கென்றே (Locality 1.
 oriented) உரித்தான தொழில்கள்
 ஏதாவது இருந்தால் அவற்றின் பெயர்களைக் 2.
 குறிப்பிடுக.
 (உ.ம்: சிவகாசி - தீப்பெட்டி, 3.
 திருப்பூர் - பனியன்
 சின்னாபட்டி - சேலை நெசவு
 தேனி - ஜின்னிங்)
10. தங்கள் / தங்களது பகுதியில் உள்ள மேல் 1.
 நிலைப்பள்ளியில் எந்தெந்தத் தொழிற்பாடங் -
 களில் மாணவர்களுக்குப் பயிற்சி அளித்தால் 2.
 அடுத்த 5-10 வருடங்களில் வேலை
 வாய்ப்பு கிடைக்கக்கூடியதாக இருக்கும்
 எனக் கருதுகிறீர்கள்? அவைகளைக் 3.
 குறிப்பிடுக.

APPENDIX - BVOCATION IDENTIFICATION QUESTIONNAIRE -II

Please fill in the spaces as indicated.

1. Please identify and mention the
job-openings in your industry/ :
organisations for school leavers
(S.S.L.C.)
 2. Please identify the job-openings
for which there is shortage of
suitably trained persons in your
Industry/organisation.
 3. Please mention if there is any
job-training facility for school
leavers(S.S.L.C) in your industry.
 4. Please mention what are the develop-
mental activities/schemes in the :
next 5-10 years in your industry.
 5. Please specify what type of
trained persons you would require
persons you would require for
the vocations that would emerge
as a result of developmental
activities/schemes in the next :
5-10 years in your industry.
 6. Please suggest a few vocational
courses that should be introduced
at the vocational stream of the
+2 stage of the Higher Secondary
Schools in Madurai District.
 7. Name and address of the Industry/
Organisation :
-

மதுரை - கா மராசர் பல்கலைக்கழகம்
கல்வித்துறை,
மதுரை - 21.

பூர்த்தி - செய்பவரின் பெயரும்
முகவரியும்

.....
.....
.....

தொழில் தொந்தெடுத்தல் பட்டியல்
(Vocational Choices Inventory)

கீழே 39 தொழில்களின் பெயர்கள் தரப்பட்டுள்ளன. அவற்றில் +2 வகுப்பில் பயிற்றுவிப்பதற்கு ஏற்றதாக நீங்கள் கருதும் ஏதாவது மூன்று தொழில்களைத் தேர்ந்தெடுத்துத் தங்கள் அறிவுப்படி கொடுக்கப்பட்டிருக்கும் சரிகை கட்டடங்களில் 1 2 3 என்று வரிசைப்படுத்தலாக.

I. PAPER TECHNOLOGY: (காகிதத் தொழில் நுணுக்கவியல்)

1. Card Board from Waste Paper (கழிவுக்காகிதத்திலிருந்து காகித அட்டைகள் செய்தல்) .. ☐
2. Handmade paper (காகிதம் செய்தல்) .. ☐
3. Paper Cups, Saucers and Bags (காகித கோப்பைகள், தட்டுகள், பைகள் செய்கல்) .. ☐
4. Paper Decorations (Origami) (காகித அலங்காரம்) .. ☐
5. Drinking Straws manufacture (பானம் குடிக்கக் குழல்) .. ☐

II. PLASTIC TECHNOLOGY (பிளாஸ்டிக் தொழில் நுணுக்கவியல்)

6. Nylon Buttons Making (நைலான் பித்தான்கள் செய்தல்) .. ☐
7. Polythene Packing Materials (பாலிதீன் பைகள் செய்தல்) .. ☐
8. Design with Plastics (பிளாஸ்டிக் வடிவமைப்பு) .. ☐
9. Plastic Arts (பிளாஸ்டிக் கலைகள்) .. ☐

III. CERAMIC TECHNOLOGY (மட்பாண்டத் தொழில் நுணுக்கவியல்)

10. Pottery (போர்ச்சிலேன் கோப்பைகள் வளைதல்) .. ☐
11. Bricks and Tiles (செடிகற்கள் - ஓடுகள் செய்தல்) .. ☐
12. Concrete and Cement Works (காரைக்கட்டு மற்றும் சிமின்ட் வேலைகள்) .. ☐
13. Mosaic Flooring (மொசைக் தளமிடுதல்) .. ☐

IV. FOOD TECHNOLOGY (உணவுப் பொருட்கள் தொழில் நுணுக்கவியல்)

14. Vermicelli Making (சேமிரா - லெயப்ப, லெழ தயாரித்தல்) .. ☐
15. Soft Drinks/Fruit Beverages (பழரச பானங்கள் தயாரித்தல்) .. ☐
16. Banana Fruit Products (வாழைக்காய், பழம் உணவுப் பொருட்கள் தயாரித்தல்) .. ☐

V. LEATHER TECHNOLOGY (தோல் தொழில் நுணுக்கவியல்)

17. Finished Leather (பதப்படுத்திய தோல்) .. ☐
18. Leather Footwear Design (தோல் காலணிகள் வடிவமைப்பு) .. ☐
19. Leather Goods Design (தோல் பொருட்கள் வடிவமைப்பு) .. ☐
20. Leather tanning (தோல் பதனிடுதல்) .. ☐

21. Leather garments Design (தோலாடைகள் வடிவமைப்பு) .. ☐

22. Leather Crafts and Leather Perforation (தோல்பொருட்கள் .. ☐

VI. MECHANICAL ENGINEERING (கைவேலைகள் மற்றும் தோல் துறையிலுள்ள தொழில்நுட்பவியல்)

23. Aluminium Spinning (அலுமினியம் கடைசல்) .. ☐

24. Stainless Steel Utensils (எஸ்சிஸ்டன்ஸ் ஸ்டீல் தயாரிப்பு) .. ☐

25. Motor Cycle and Scooter Works (மோட்டார் சைக்கிள், ஸ்கூட்டர் பராமரிப்பு) .. ☐

26. Tyre Works and Tyre Retreading (டயர் பராமரிப்பு - டயர் புதுப்பித்தல்) .. ☐

27. Wood and Wire Design (மரம் மற்றும் வயர் வடிவமைப்புக்கள்) .. ☐

VII CHEMICAL ENGINEERING (ரசாயனத் தொழில்நுட்பவியல்)

28. Match Industry-Fire Works (தீப்பொட்டி மற்றும் பட்டாசு தொழில்) .. ☐

29. Bone Meal (எலும்புத் தாது) .. ☐

30. Detergency (சலவை சோப்பு தயாரித்தல்) .. ☐

31. Camphor Tablets - Candles Manufacture - Tooth Powder Making (சூடம் (கற்பூரம்) - மென்துவர்த்தி - பல்பொடி தயாரித்தல்) .. ☐

32. Cattle-Poultry Feed (கால்நடை, கோழித் தீவனம்) .. ☐

33. Distemper, Varnishes and Paints Making (வண்ணப்பூச்சு, வார்னிஷ் மற்றும் பெயிண்ட் தயாரித்தல்) .. ☐

34. Jasmine Oil Extraction (மல்லிகை வாசனைத் தைலம் தயாரித்தல்) .. ☐

35. Jewellery and Gold Covering Works and Mirror Works (தங்க நகைகள் - தங்கமலாம் பூச்சல் - சூன்ம ரசம் பூச்சல்) .. ☐

VIII. MISCELLANEOUS (பிற தொழில்கள்)

36. Creative Writing (எழுத்தாக்கத் திறன்) .. ☐

37. Speech Therapy (பேச்சுக்குறைபாடு நீக்கல் சிறை) .. ☐

38. Fountain Pens and Nibs-Servicing and Manufacture (பென், நிப்பு பகுதம், தயாரிப்பும்) .. ☐

39. Medical Shop Assistant (மருந்துக்கடை உதவியாளர்) .. ☐

APPENDIX - DLIST OF EXPORTS PARTICIPATED IN THE CURRICULUMDEVELOPMENT WORK

- | | |
|---|---|
| 1. Prof. N. Selvarajan | } Dept. of Mech. Engg.,
TTTI, Madras-20. |
| 2. Mr. M. Anandapadmanabhan | |
| 3. Mr. Sirajudeen Sharief, Lecturer, Central Poly-
technic, Madras-20. | |
| 4. Dr. S. Guruvaih, Scientist, Paints Making Laboratory.
CECRI, Karaikudi. | |
| 5. Mr. K.T. Veeraraghavan, Scientist, SECRI, Karaikudi. | |
| 6. Mrs. A. Susheela Thirumaran, | } Dept. of Home Science
} Agricultural College,
} and Research Institute.
} Madurai-4. |
| 7. Mrs. Andal | |
| 8. Mrs. Dhanalakshmi | |
| 9. Mr. V.S. Karunakaran | |
| 10. Mr. P.R. Seshadri Raman | } Govt. of India,
} SISI, Madras-32. |

Opinion Survey on Vocationalisation(O S V)

1. Name :- 2. School:
3. Standard:..... 4. Vocational
stream

A. For students.

After completing the Vocational Stream of Higher secondary stage,

1. Can you start your own industry/business. Yes/No.
2. Are you seeking employment in the private/
public enterprise Yes/No.
3. Are you going to continue your study in Arts
and Science college? Yes/No.
4. Are you going to join professional college? Yes/No.
5. Do you have the necessary expertise to
start self-employment? Yes/No.
6. Have you got the necessary capital to
start your own industry/workshop/business Yes/No.
7. Do you require more specialization in the
same field to be able to start your own
venture? Yes/No.

B. For teachers and the Public

1. Do you think your students/wards are
adequately trained to start their own workshops/
units/industry. Yes/No.
2. Do you prefer that they should join a public/
private enterprise? Yes/No.
3. Do you think they are mature enough to manage
their own industry/workshop/business Yes/No.
4. Do you feel that the vocational stream students
are not so bright in their studies?(as academic
students) Yes/No.
5. Do you think the same vocational course should
be extended to the collegiate stage? Yes/No.

LIST OF INDUSTRIES

1. Sitalakshmi Mills, Thirunagar.
2. Madurai Coats, Madurai.
3. S.I. Ltd., Rubber Unit, Madurai.
4. Metal Powder Co. Madurai.
5. Fenner, Madurai.
6. P.R.C. Madurai.
7. Rukmini Mills, Madurai.
8. Thiazarajar Mills, Kappalur.
9. Pandyan Automobiles(P) Ltd., Madurai.
10. Industrial Estate, Madurai.

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APPENDIX -G

List of schools contacted for data collection.

1. Govt. Higher Secondary, Madurai-10 (G)
2. Govt. Higher Secondary, Melur -(G)
3. Corporation Higher Secondary Madurai-10(G)
4. N.S. Higher Secondary, ~~Madurai-10~~Theni (G)
5. Sri Meenakshi Sunderaswarar Higher Secondary
Madurai-9 (G)
6. Sethalakshmi Higher Secondary, Madurai-6(G)
7. P.K.N. Higher Secondary, Thirumanjalam(G)
8. TELC Higher Secondary School, Usilampatti(G)
9. Govt. Higher Secondary, Sholavandan (B)
10. N.S. Higher Secondary, Usilampatti(B)
11. P.K.N. Higher Secondary, Thirumanjalam(B)
12. N.S. Higher Secondary, Theni (B)
13. M.N.U.J.N. Higher Secondary School Madurai(B)
14. Sourashtra Higher Secondary, Madurai(B)
15. Thiagarajar Model Higher Secondary, Madurai(B)
16. U.C. Higher Secondary School, Madurai-(B)
17. Sethupathy Higher Secondary School, Madurai(B)
18. Madurai College Higher Secondary, School, Madurai(B)
19. Govt. Higher Secondary School, Usilampatti(B)
20. Govt. Higher Secondary School, Karunjalakudi(B).

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APPENDIX -H

LIST OF VOCATIONAL COURSES OFFERED IN THE ~~SCHOOLS~~
HIGHER SECONDARY SCHOOLS OF MADURAI DISTRICT.
- - - -

1. Electrical Domestic Appliances Repairs and Maintenance.
2. Electrical Motor Rewinding.
3. General Machinist
4. Radio and Television Maintenance and Repairs.
5. Textile Technology
6. Health Medical Laboratory Assistant
7. Nursing
8. Music
9. Agro based Industries.
10. Dairying
11. Small Farm Management.
12. Vegetable and Fruits
13. Child care and nutrition.
14. Dress designing and making.
15. Dietetics nutrition and food preparation.
16. Food preservation.
17. Accountancy and adding
18. Business Management.
19. Office Secretaryship.

APPENDIX - I

VOCATIONALISE THE PLUS THREE STAGE

The 10+2+3 pattern of education was introduced with the specific aim of making students more employment-worthy through vocationalisation of the +2 stage. It was expected that this stage would integrate academics with vocationalism, relate the world of education with the world of work, prepare middle level manpower who would work with their brains ~~xxxxxx~~ and hands, and produce entrepreneurs who would become creators of jobs for themselves and for others.

It was hoped that if a wide range of vocational courses was provided at the two year block of higher secondary stage, a fair proportion of students would be diverted from rushing to colleges and crowding in the universities.

Vocationalisation was introduced at the higher secondary schools in Tamil Nadu from the academic year 1978-79. The first batch of the +2 students have come out and it may be appropriate now to discuss how far the expectations and hopes are being fulfilled in the new system of education.

The findings of a District Occupational Needs and Public Opinion Survey undertaken by the authors from the Department of Education, Madurai Kamaraj University and sponsored by the NCERT are as follows:-

Most of the students from the Vocational stream are seeking admission to not only professional colleges

but to Arts and Science colleges as well. The vocational courses have not trained the students in the vocational skills to the levels and quality acceptable to the employers either in private or public enterprises; not have the students developed the necessary abilities and confidence for self-employment. The overcrowding of students in the colleges has not reduced at all.

The Occupational Needs Survey identified about 40 vocations with employment opportunities either at present or in the immediate future. The five priority courses identified by the enlightened public of the localities in and around Madurai district are; Aluminium spinning, manufacture of stainless steel utensils, distemper, varnishes and paints-making, motor cycle and scooter technology and soft drinks and fruit beverages.

The questions we may now pose are: Is it possible for some of the higher secondary schools in this area to introduce these courses? Have they got the resources and the expertise?. Would adequate financial support be available to start such courses?. Are there competent teachers to give practical training in the vocational skills involved in these courses?. Would the students at the immature age of 15+ to 17+ be able to master the cognitive and psychomotor skills involved in the operation of ~~xxx~~ sophisticated machinery?

Even assuming that all these are possible, will the students, when they leave school just ^{at} the age of

17+ have the worldly wisdom essential for getting the necessary licences and permits to start an industry, tackle the problem of financing it, procure the raw materials, manage the workers and market the goods competing with other established and reputed industries? In short, how are would the students be able to create employment for themselves and for other's?

This leads us to think, is not the +3 stage more suitable for offering such vocationalised courses? The rationale would be: The students would be more mature to learn the skills and abilities involved; a job-oriented university degree would be more welcome to the students, the parents and the employers in our degree-crazy society. Universities and professional colleges would be in a better position to offer sophisticated vocational courses, as they may have the necessary equipments, resources and expertise and the young graduates from colleges at the age of 20+ may be better experienced in creating jobs for themselves and for others.

Much of the educational system to-day is aimed at answering "I must earn a living; how ^{am} I going to get a job?" That is the priority item under which we are all working all the time--the idea of learning to earn a living."

Some universities are exploring ways and means of starting "job-oriented courses". Let the university authorities be aware of the needs and demands of the community

as well as the industrial trends of the locality while offering such courses.

The feeling that the academic stream is meant for better students and vocational stream for less able students is very much in the forefront among the students, parents and the public. Every student is keen to go into the academic stream so that in course of time he can go to college and get a degree. He does not seem to be much concerned as to how long he would have to wait before the degree gets him a job.

Let the universities think in terms of giving a degree which would get him a job as well as equip him with abilities to adapt to a variety of jobs. Let the Universities not prepare students for "job" that is not there, never was, and never will be; but let them begin to train young people for "work" which is abundant-- either on their own or in the industries.

Dr. (Mrs) J.K. PILLAI

&
Kokila S. Thangasamy,
Department of Education,
Madurai Kamaraj University,
Madurai.

(Published in THE HINDU on October 26, 1981.)

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SCHOOL TECHNOLOGY FORUM WORKING PARTY ON CURRICULUM AND EXAMINATIONS-MODULE 3 MECHANISMS

SYLLABUS			PUPIL ACTIVITY
Syllabus items	Technological Framework of Syllabus		
Ideas and Concepts to be seen from a technological point of view.	Technological Design "tools" methods and conventions.	Technological Resources of application and experience.	

OBJECTIVES

TEACHERS' NOTES

COLUMN FOR NOTES

To help children
be able to

(Reading develop-
ment).

Resources

Visual Hardware Texts.

Equipment Required
For Lesson

N.B:-
Taken from format
SCSST(1975) (Refer
to page.110)

BOOKS FOR TWO WHEELERS

Small gas engines

by ALFRED C. ROTH AND RONALD
J Baird.

Publishers: The good heart-
willcox company, South Holland,
Illinois, U.S.A.

Vespera

by R.V.BRYANT S.Chand&Co(PVT) Ltd.
Ram Nagar, New Delhi-110 055.

The First book of the
Vespa

by J. EMMOTT

The second book of the
Vespa.

by PITMAN

Know your motor cycle
and scooter

by HARBANS SINGH RLYAR

Published by S.Chand&Co. Ltd.
Ram Nagar, New Delhi-110 055.

Two-stroke motor cycles

London ILIFFE Books Ltd,
Dorset House, Stanford Street,
London S.E.1.

Lambretta

by REYMOND BROAD,
S.Chand & Co. Ltd,
New Delhi-110 055.

The Motor Cycle

by SIGGFRIED HERMANN
Asia Publishing House, Madras.

Workshop Manuals for

- 1) Rajdoot.
- 2) Enfield bullet & Crusader
- 3) Jawa and Ezdi
- 4) Suveja
- 5) Luna
- 6) B.S.A
- 7) T.V.S. 50.
- 8) Dart
- 9) Vicky.

APPENDIX

12

Year BIOCHEMISTRY AND FUNDAMENTALS OF NUTRITION (Introductory course).
 Syllabus Ideas & Pupil Activity Objectives Teaching methods & Resources
 Items Concepts

(1) (2) (3) (4) (5)

Carbohydrates Definition Selection of To help the Slides Slides
 Chemistry carbohydrate learner be Posters Slides
 classification rich foods. able to Film Filmstrips
 sources/ recognize the strips
 Digestion/ importance
 absorption/ of energy and
 Requirement energy giving
 metabolism foods, design
 Deficiency or grouping of
 Preventive carbohydrate
 measures. foods. evaluate
 the energy/
 CHO content
 of goods.

Protein-3 Definition, Identification recognize the Slides Slides
 chemistry, of protein importance of Posters Film Strips
 classification rich goods protein rich Film
 tion, sources Planning foods planning strips
 digestion, High protein, diets evaluation
 absorption, high calorie of the nutritive
 functions, diets. value.
 requirement, diets.
 metabolism
 Deficiency
 diseases,
 preventive
 measures.

(1)

(2)

(3)

(4)

(5)

Liquids

Definition, chemistry classification, sources, digestion, absorption, functions, requirement, metabolism	Identification of protein rich foods planning High protein, high caloric diets.	recognize the effects of excess fats in the diet.	Posters Posters.
Deficiency, diseases, Preventive measures.			

Vitamins

Identification of vitamin rich food.

recognize the deficiency diseases of individual vitamins

Slides Slides

Definition, History Chemistry, sources, digestion absorption, functions requirement deficiency diseases preventive measures.

Minerals

Identification of mineral rich foods.

recognize the deficiency diseases of individual mineral.

Slides Slides.

Definition Chemistry, sources deficiency diseases requirement

(1)	(2)	(3)	(4)	(5)	(6)
-----	-----	-----	-----	-----	-----

Manufacturing of Soft drinks/Fruit Beverages.

Use of enzymes,
Fruit juice,
esscent rates,
Carbonation,
soft drink mixes,
bottling, Paste,
tablets.

Methods-Techniques
involved in the
processing of the
above items.

Involving
in the pre-
paration
of the
above.

Flow sheet
diagrams,
field trips
to the furit
processing
industries
(pilot plant
unit).

Quality Control and Marketing.

Quality control,
effect of
preparations
and processing
on nutrients.
ISI standards,
cutout analysis,
Food laws
Agmark
FPO
Activities.

Explanation of
specific
standards
for the
above.

study of
the above
standards.

Recognize
the impor-
tance of
the above
standards.

(1)	(2)	(3)	(4)	(5)
-----	-----	-----	-----	-----

Enzymes	Definition, Chemistry, Functions	Identification of sites of production	recognize the role of enzyme in metabolic cycles.	Posters Posters
---------	----------------------------------	---------------------------------------	---	-----------------

Pigments	Definition chemistry classification	Identification of samples of each pigment	recognize the importance of effect of working of each pigment.	Chart Charts.
----------	-------------------------------------	---	--	---------------

Hormones	Definition, chemistry, functions, hypo & hyper affects	Identification of functions of each chromosome	recognize the hypo & hyper affects of each hormone	Chart Chart.
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Chemistry of Horticultural Products.				
(1)	(2)	(3)	(4)	(5)

Role of Horticultural Products in Human Nutrition	Different fruits, vegetables and their role in normal and therapeutic diets.	classification of greens, roots, vegetables and fruits.	Planning small kitchen gardens	Visit to the Horticultural gardens.
---	--	---	--------------------------------	-------------------------------------

Nutritive value of fruits	Different types of fruits, and their nutritive value changes in nutrients due to cooking	Analysing the nutrients of fruits.	Analysis of vitamin (C) content of fruits	Visit to the labs and processing units.
---------------------------	--	------------------------------------	---	---

(1)	(2)	(3)	(4)	(5)	(6)
-----	-----	-----	-----	-----	-----

and processing

sensory evaluation of fruits

Learning the score card techniques

conducting evaluation tests

Changes in Post harvest technology.

Post harvest treatment precooling-waxing fumigation-freezing-irradiation.

Actual involvement in the above practical.

Learning the techniques for the above treatments. flow sheet diagram slides.

Principles of fruit processing.

Importance and scope of fruit processing industries in India.

Principles of layout for small scale and large scale

Planning the equipment and requirement study of economies.

To plan To collect the equipment or fruit then appraisal processing of the utility industries. Slide or Film Strips

(1)

(2)

(3)

(4)

(5)

(6)

Equipment for canning

metal-glasses plastic containers their use.

study of the effect of preserving the fruits in the above containers.

Conduct small studies on canning and bottling.

Processing by the use of salt, sugar, preservative of juices.

Canning of vegetables

Actual involvement in the canning bottling and pickling.

canning of vegetables fruits candy making pickling? sources, kitchnoop at.

Flow sheet diagram.

Final year 1st Course-- Microbiology.

Role and history of Micro organisms, bacteria, yeast, fungi, algae, virus.

History, Classification of individual organisms, role, in food preservation

Identification of individual organisms.

Recognizes individual organisms.

Actual samples

Nitrogen cycle,

Role, its importance

Charts.

(1)	(2)	(3)	(4)	(5)	(6)
-----	-----	-----	-----	-----	-----

Formation
importance
of micro-
organisms in
food products
Food spoilage
Food poisoning.

Causative organi-
sms.

Identification
of each
organism.

Microscopic
studies.

Technology of Fruits Processing.

Preparation of
Juices,
Squashes,
Syrup,
Concentrates,
cordials,
fruit preser-
vatives, cordials,
crystallised
fruits,
fermented fruit
juices, wine,
vinegar,
sulphating
of fruits,
leather.

Methods-
techniques-
involved-
(preserving-
preparation-
preservation).

Involving
in the preparation
of juices,
squashes

learning the
techniques
involved in
the above
preparation.

flow
short
diagrams
field
trips to
print
processing
industries.

Manufacturing of soft drinks/Fruit Beverages.

Use of enzymes,
Fruit juice,
concent rates,
Beverages,
Carbonation,

Methods-Techniques
involved in the
processing of the
above items.

Learning the
Techniques for
the above.

Practicals

MICROBIOLOGY

1. Sterilization techniques
2. Preparation of culture media
3. Isolation and purification of microorganisms from decayed fruits and vegetables.
4. Standard plate count method to assess number of microorganisms from spoiled cans
5. Effect of different preservatives on the control of microorganisms.
6. Coliform test to assess microbial load in different water samples
7. Isolation of nitrogen fixing microorganisms- symbiotic and non symbiotic.
8. Wire Making
9. Paper disc assay to find out the efficiency of different antibiotic, on B.Subtilis.

Practicals.

BIOCHEMISTRY

(1st year).

Analysis of simple sugars,--Starch--Carbohydrates.

Analysis of protein by Micro Kjeldal apparatus.

Analysis of liquids by Soxhlet apparatus

Estimation of Vitamin C --Calcium--Iron--Phosphorous.

NUTRITION (1st Year).

1. Reducing and non-reducing sugars.
2. Proteins and amino acids.
3. Vitamin B1, C, and A.
4. Estimation of Calcium, Phosphorous and iron.

5. Energy value of foods.

6. Determination of Total energy requirements.

III. CHEMISTRY OF THE HORTICULTURE PRODUCTS. (1st/ Year)

Practicals:-

Analysis of reducing and non-reducing sugars.

Sensory evaluation of fruits and fruit products.

Effect of cooling on texture, chlorophyll, carbonoids, and flavonoids.

Ripening studies with Banana--Effect of Ethanol.

Effect of ripening of fruits.

Fumigation of dried fruits.

Effect of eradication of fruits and vegetables.

Freezing of beans.

Principles of fruit and vegetables processing.

1st Year. Preparation of the layout for an industry.

Equipment for small scale, large scale and Home scale unit.

Canning of fruits and vegetables (pine apple, mango, orange). preparation of squashes, juices, jams, jelly, refrigeration and cool storage, freezing of beans, candy making, cherries, hatchups, soups and sauces, pickles and chutneys, beverages like tea, coffee, milk drinks.

Preparation of fruit juice concentrates.

development of ready to drink soft beverages.

Technology of fruit processing-(II nd Year).

Preparation of 1) Clear juices, 2) squashes, 3) syrups, 4) Concentrates, 5) cordials, 5) fruit preserves. 7) candies 8) crystallised fruits 9) Vinegar, 10) wine.

III. Manufacturing of soft drinks-Fruit beverages.

Preparation of fruit juice concentrate

Formulation and development of soft drinks.

Carbonation.

Dry soft drink mixtures.

Bottling.

Fruit juice concentrate,
pastes.

MICROBIOLOGY

Practicals. (IIInd Year).

Techniques of sterilization methods-preparation of media and culture of microorganisms-study of different microorganisms--Microscopic examination of representative groups of fungi, bacteria/ and other organisms for morphological and physiological characteristics study of microorganisms in natural systems: soil, water, sewage etc.

Quality controlling and Marketing (IIInd Year).

Cutout analysis of canned fruits and vegetables.

Deduction of food Adulterants.

Analysis of sulphordioxide in the bottled products.

Analysis of Acidity in fruits.

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Brown(M.L) 1967. approach".
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Wiley Eastern Pvt. Ltd,
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16. Watt(Bernice, K) and Merrill(Moonabell) "Composition of foods Raw, Processed, Prepared". 1963. U.S. Department Agriculture, Washington, D.C.

The following equipments/apparatus are required.

1. Glassware, Burette, Pipette, Beaker etc.
2. Density-Pycnometer or hydrometer or specific gravity balance.
3. Apparatus for gel strength.
4. Apparatus for melting point.
5. Apparatus for oil absorption.
6. Kerbs-stormer viscometer
7. Driving time recorder.
8. Jar mill for paint/grinding (small size).
9. Reaction kettle for varnish preparation (lab size).
10. Weight per gallon cup.
11. Apparatus for specific gravity of pigment.
12. Apparatus for settling of pigment in paint.
13. Ford cup viscosity cup (No. 3 or 4).
14. Hegman Fineness of dispersion.
15. Film applicator
16. Gloss meter
17. Film thickness measurements (Elcometer).
 - a. Wet film thickness gauge
 - b. Dry film thickness meter.
18. Pfund Black and White cryptometer for Hiding power.
19. Drying time recorder.
20. Hardness tester
21. Adhesion tester
22. Permeability cup
23. Taber abrasion tester
24. Salt spray tests chamber (Demonstration)
25. Humidity cabinet (Demonstration).
26. Sand blasting equipment (Demonstration).
27. Wethero meter (Demonstration).
28. Impact tester
29. Paint application by spraying
30. Glass liquid chromatography (Demonstration).
31. Ultraviolet spectroscopy (Demonstration).
32. Infrared spectroscopy (Demonstration).

APPLIED SCIENCE

Topic

ideas and Concepts

objectives

Teaching
methods

Resources
Aids

Texts

Thermo-

dynamics

laws

Air cycles

Carrot, otto,
Diesel cycles
compression
ratio

1. Familiarize
with the
indicator
diagrams.

Lectures/
discussion

Charts.

stroke volume
cylinder volume
clearance volume

2. Conversant
with the
Engines para-
meters.

Air standard
efficiency of
the carrot, otto
and Diesel cycles
and problems.

3. Conversant
with proper-
ties of fuels

Fuels

Petrol, Diesel,
alcohol, Aditives
Combustion problems
Calorific values

Lectures/
discussion

Knocking-
time lag
effect of
rich and
lean mixtu-
re

conversant with
the combustion
problems in
Engines.
Familiarize with
air fuel ratios
at different
engine speeds.

Ignition
advance
Ignition
retard.
Anti Knock
fuels HVOIR.

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(2)

(3)

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(6)

Carburetion-
air fuel ratio
principles.

Lubrication

Methods of
lubrication
wick, gravity, con-
versent
flash & self
lubricating,
bearings
pressure
lubrication
petroleum lubri-
cation Aero-
dynamic and
oil lubricat-
ion. qualities
of lubricants,
viscounting
grades of
lubricants.

Conversent

Lecture

Charts
Models.

Electricity.

D.C. Motors.

and generators
working of motors

alternators

Rectifiers

Couplings

standard cables

ISI column crdes

as used in auto

wiring

Conversent with

Generators and

alternators.

Lecture

Demonstration

Charts
Models.

(1)	(2)	(3)	(4)	(5)	(6)
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Effect of voltage convertent with drop due to resistvarious faults in wire&joints causes and remedies			Lecture Demonstration	Charts.	
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wiring circuits Battery charging and maintenance.		convertent with the Battery maintenance and charging.	Lecture Demonstration	Charts.	
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Preparation of Electrolyte		preparation of Electrolyte for voltting	Lecture Demonstration	Charts.	
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Heat transfer as applied to the cooling system in 1c Engines.		convertent with cooling of Engines . Convertent with effect of excessive heating of engines and remedies.	Lecture Demonstration	Charts	
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Adhesive and Insulators		familiarize with different type of adhesive and insulation material for fast and electricity oil seals fasteners	Lecturer Demonstration	Charts.	
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(1)	(2)	(3)	(4)	(5)	(6)
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Materials and Processes

Metals	Metals used in manufacture of auto components. Ws. Al, CI, GM. Brass, alloys fibre, Grass, Nylon	1. familiarize with the qualities of metals. 2. familiarize with the important alloys and their properties. 3. familiarize with the heat treatment process.	Lecture	charts	
Heat treatment of metals	Tempering, annealing, hardening various methods.		Lecture	Charts	
Testing of metals	yield stress, ultimate stress shear stress Hardness, Toughness, Effect of direct loading, bending, torsion	4. familiarise with the characteristics of metals and alloys	Lecturer Demonstration	Charts demonstration in laboratory on machines.	

(1)	(2)	(3)	(4)	(5)	(6)
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Manufacturing process

casting, forging Discastin', defects in the above use of rubber vulcan- izing and manu- facturing of tyres and tubes and retreading.	1. familiarize with the casting methods.	Lecture	Charts.
2. familiarise with the general defects that occur in castings.			

3. familiarise with
the general
principles
of manufacture
of tyres and
tubes and repair.

Protective coatings.

corrosion of metals-conversion prevention. surface preparation and coating with protective castings both metals and prints.	1. familiarize with the corrosion problems.	Demonstration	charts.
2. familiarize with the methods of protective coating- of metals.			

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Hand Tools

Hand tools used in fitting, forging, and other shops, Gauges used for measurements- calipers, micrometers, internal hydrometers, Dial gauges, clip-hs gauges-cylinder gauges, ft-lar gauges.

conversant
Lecture
Demonstration

Charts.
tools

Forging

upselling, drawing out, sivating forging of simple components like hexagonal bolts, eye bolts, clamps etc.

conversant with hand the forging operations.

Lecture

Charts

conversant with the methods of making small components.

MACHINE SHOP.

Lathe

Lathe-parts and its working- operations-turning falling, tapes turning, drilling, boring, thread cutting and knurling

Conversant with the components of the bath. conversant with the various operations that can be performed in a bath.

Lecture
Demonstration

Charts
Laths.

Drilling M/C

working of drilling machine and its parts. operations-drilling tapping, reaming use of taps and dies.

conversant with the various operations in a drilling M/C

Lecture
Demonstration
Charts
Drilling
machine
Tools.

Grinding

working and use of Bench grinder pedestal grinder surface grinder flexible shaft grinder. precautions while performing grinding

conversant with different types of grinders.

conversant with the grinding methods on the machines.

Welding and Gascutting

Gas welding, gas cutting- flame hardening, Electric arc welding machines construction and working methods Arc welding methods Defects in the welded joints brazing and soldering.

conversant with the gas welding and cutting conversant with the various nozzles.

Lecture
Demonstration

Charts.

conversant with the working of Electric arc welding machines conversant with the welding methods. conversant with general defects in welded joints conversant with soldering and brazing

Syllabus		Teaching		Resources	Remarks.
Topic	Sub Topic	Objectives	Methods	Books	Aids
Engine	Four stroke petrol and Diesel Engines constructional details and working principles.	<ol style="list-style-type: none"> 1. understand the working of four stroke Engines- 2. understand the working of Two stroke Engines. 3. understand the methods of fuel and air supply to petrol and Diesel Engines. 	Lecture Demonstration	<ol style="list-style-type: none"> 1. Charts 2. Cut section models. 3. Transparency on OHP. 	
	Two stroke petrol Engines and two stroke Diesel engines.	<ol style="list-style-type: none"> 1. understand the working of two stroke Diesel and petrol Engines. 2. Familiarise with the construction details. 	Lecture Demonstration.	<ol style="list-style-type: none"> 1. Charts 2. cut section models. 3. Transparency on OHP. 	
	Multi cylinder Engines.	<ol style="list-style-type: none"> 1. Familiarise with the construction and advantages of multi cylinder Engines. 	Lecture and Demonstration	<ol style="list-style-type: none"> 1. Charts 2. Models- dynamic. 	

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Valves and valve
actuators
mechanism valve
timing

1. Familiarise
with the
construction
of valves and
valve actuating
mechanisms.

Lecture
Demonstration

1. Charts
2. Models-
dynamic.

2. Importance of
the valve
timing .

3. Familiarise with
the defects due
to faulty valve
timing and
rectification.

Part-timing

Determine valve
timing and
port timing.

Pistons.
Piston rings and
oil rings
connecting rod

1. Familiarise with
the construction
details of piston
and piston rings
and
crank shaft and
fly wheel.
Bearings.

Lecture
Demonstration

1. Charts
2. Actual
components.

2. Arrangement of
piston rings.

3. Know the purpose
of fly wheel and
balancing of the
flywheel and
crank shaft.

(1)	(2)	(3)	(4)	(5)	(6)
	4. Familiar work different types of bearings.		Lecture Demonstration		1. Charts 2. Actual components.
	5. Know different metals used for the components.				
	<u>Fuel system</u>				
	Carburettors Types working and construction fuel supply lines filters and taps.	1. Familiarize with different components in carburettors. 2. different circuits. 3. Adjustments in carburettors. 4. Locate faults and remedy the same.	Lecture Demonstration.		1. Charts 2. OHP transparency 3. Models.
	Diesel injection pumps-injection nozzles. Caliberation of the jump. fuel filters & air filters.	1. familiarize with the various parts of fuel injection system. 2. Caliberates a pump. 3. Remove impact and replace the components. 4. Detect faults in the system, find the cause and rectify.	Lecture Demonstration		1. Charts 2. Models.
	Faults are residues of the xxx above.				

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~~Refrigeration~~

Cooling of
the Engine
oils and
waters cooled
type-forced
air circula-
tion.

Lectures
Demonstration

Charts
Models.

Electrical
Systems.

Cell and mag-
netro ignition
systems spark
plug

Charging syste-
me:

Dynamo.
Alternator-
Rectifiers
Battery.

Lightning
systems
Electrics
horn.

Electronic
system.

Electrical
faults-causes
and remedies.

1. familiarize
the components
and working
of ignition
systems used
for two
whealers.

2. Locates faults
and rectify

3. Familiarises
with the
modern igni-
tion systems.

Lubrication.

Lubrication of
two stroke
engines and
four stroke
Engines.

(1)	(2)	(3)	(4)	(5)	(6)
	oil pump-working lub oil filters.	1. familiarize with the lubrication methods. 2. familiarize with lubrication systems components. 3. familiarization of the grades of oils.	Lecture Demonstration		1. Charts 2. Models.
	grades of lubri- cants used. Lubrication faults causes and remedies.	4. locate faults and rectifying			

Transmission.

Function of transmission.

clutch-Dry and wet clutches- multi plate- centrifugal clutches. Friction materials clutch accelerating mechanisms.	1. familiarise with different types of clutches. 2. list the compo nents. 3. familiarise with the actuating and control mechanisms. 4. To detect faults and remedy.	Lecture Demonstration		1. Charts 2. Models.
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(1)	(2)	(3)	(4)	(5)	(6)
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Gear box Types of gear boxes. Gear shift mechanism. Transmission troubles and remedies.	1. familiarize with the different types of gear boxes. 2. locate faults find cause and remedy. 3. Gear box workshop.	Lecture Demonstration	1. Charts 2. Models.
Gear lubrication methods & maintenance.			

Drive line Chain drive, shaft drive universal joints sprockets. chain covers & lubrication.	1. to familiarize with the different drive methods. 2. Know methods of lubrication the system.	Lecture Demonstration	1. Charts 2. Models.
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Function of the suspension system.

Suspension. Shock absorbers-springs construction details of units	1. familiarize with the suspension systems.	Lecture Demonstration.	1. Charts 2. Models.
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(1)	(2)	(3)	(4)	(5)	(6)
Handle bar	Brake testing safe braking distance.	3. should be able to explain the procedures of servicing the mechanical and hydraulic braking systems.	Lecture Demonstration	Charts.	
	Hydraulic brakes and their work- ing. Master cylinders. slave cylinder.				
Frame & body.	Control levers and cables. Twist grip control.	1. Familiarize with the various control systems.	Lecture Demonstration	Charts Models.	
	frame head bearings- testing of frame and rectification methods. Frame balancing.				
	Body construction and fastening methods-mud guards, chain- ing Electro plating.	2. should be able to explain the testing and setting procedures. 3. should be able to explain the painting procedures and electroplating methods.			

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ent gas filled.
shock absorbers &
working.

Suspension tubes
and springs.

Testing of
suspension
springs and shock
absorbers.

Troubles, causes
and remedies.

2. Able to test

the rubber absor
bers for effici-
ency in working.

3. Able to service
the suspension
systems.

4. Able to verify
the troubles.

Lecture
Demonstration

1. Charts
2. Models.

Function of brakes.

Braking
system

Brake drum-
construction
details Brake

shoe construction
Mechanical brake-
can actuation and
control mechanism.

Brake lining-
Material & formation
Brake lining & riveting
on shoes Brake
troubles causes, &
remedies.

1. understand the

construction and
operation ~~and~~ of
the various
components.

2. familiarize with
the methods of
forcing the lin-
ing and listing
brakes.

3. should be able

to explain the
procedures of
servicing the
mechanical and
hydraulic
braking systems.

Lecture
Demonstration

1. Charts.

(1)	(2)	(3)	(4)	(5)	(6)
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Road wheels

Wheel rims
and sparkes.
split rims.

Defects in rims Explain
rectification the proce-
Mounting bear- dures of
ngs of wheels. checking
Types-constru- rims and
tion details setting
Removal and spokes
replacement of
tyres and Tubes Able to explain
Vulcanizing of the tyre and
tubes-retreading the tyre and
of tyres. Tube service
Wheel Balancing- and mounting
static and procedures.
Dynamic.

Lecture
Demonstration

Charts
Models.

Charts

Lecture
Demonstration

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